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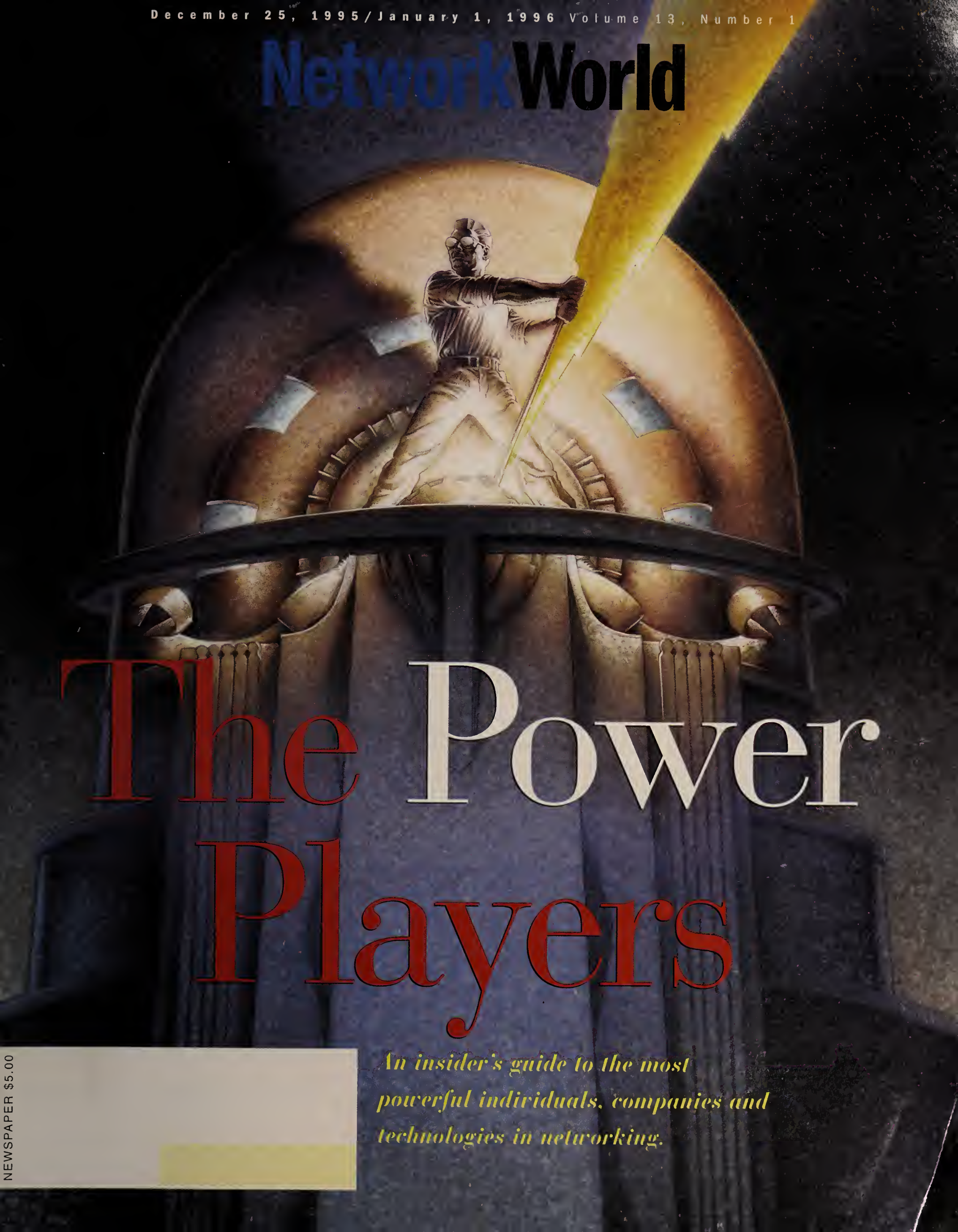

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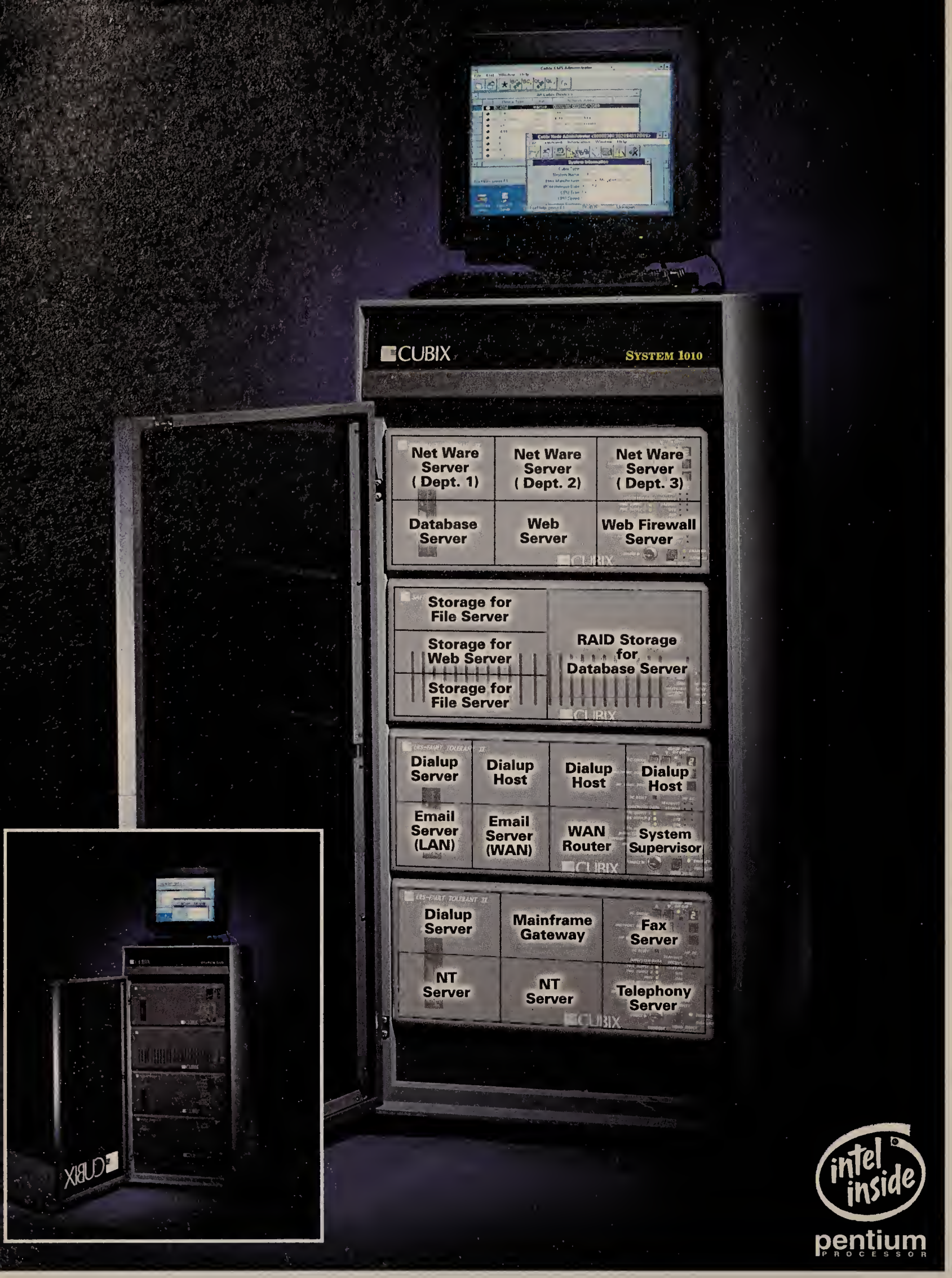

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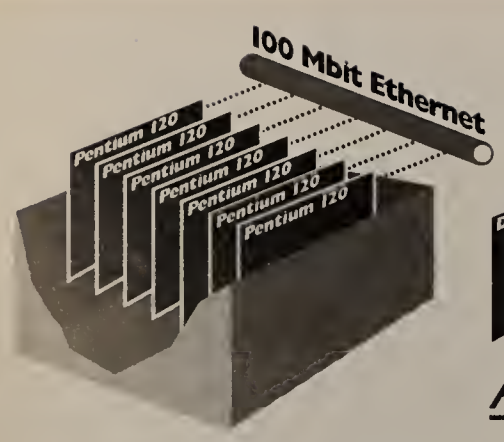

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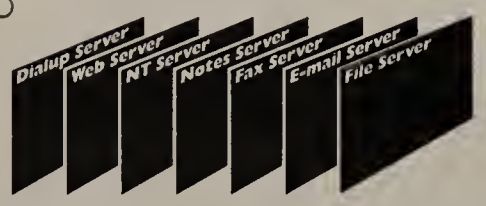

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The Power Players

A SPECIAL ISSUE OF NETWORK WORLD • AN IDG PUBLICATION

EDITOR'S NOTE

Start with one part brilliant entrepreneurs, blend in a ration of envelope-pushing technology savants, add a solid measure of virtuoso customers, and spice it with a splash of outspoken analysts, freethinkers and various other personalities, and what do you get?

The network industry.

It's the place to be, whether you're choosing a career, launching a company, building a better mousetrap, investing your millions, trying to make a million. The network industry is the white-hot center ("Look at me, Ma! I'm on top of the world!) of the high-technology world and the darling of Wall Street — at least through most of 1995. Networking is the shaper and shaker of economies. Even Newt Gingrich and Al Gore see eye-to-eye on that. And if the Dems and GOP can finally get together on a bill to unshackle the industry from archaic regulations, networking will go into hyperdrive.

To help you keep up, we offer this second annual guide to the most powerful companies, individuals and technologies in networking. Keep it on hand. You can't tell the players without a scorecard.

—John Gallant

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Cover illustration by Douglas Klauba

On the edge of chaos

Q: What is $555 billion big and isn't broken but always fixing itself?

A: The network industry, as codified in the second annual Network World 200, a list of vendors ranked by revenue that also serves as a supplier health gauge and simple directory. Page 6.

The 10 companies to watch in '96

Hot start-ups like Spider Technologies will creep into the picture, while Ameritech and other industry veterans will come calling. Discover why these and other companies are on our list of the top 10 companies worth watching. Page 19.

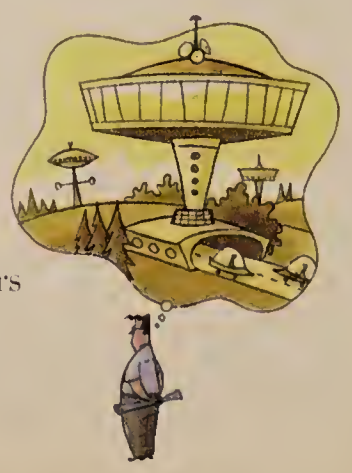
GARY LOCKE

The 25 most powerful people in networking

Who's on top in the network industry? Find out in our annual accounting of the wheelers and dealers, the back-room brokers, the behind-the-scenes movers and shakers — all the power brokers in the world's most powerful marketplace. Page 31.

User Excellence Awards

Our User Excellence Awards winners are proving the power of networking. Panhandle Eastern Pipe Line's client/server network saved the company $4 million in 1995 alone, while Ryder System's new net is likewise driving up profits. Stories begin on page 56.



TERRY COLLON

Power planning

See how you're planning powers map up against those of your peers in our annual Technology Planning Survey. Page 71.

Advertiser and editorial indexes. Page 94.

Network World

200

On the

The network world crosses the half-trillion

"Complex systems seem to strike a balance between the need for order and the imperative to change. Complex systems tend to locate themselves at a place we call 'the edge of chaos.' We imagine the edge of chaos as a place where there is enough innovation to keep a... system vibrant and enough stability to keep it from collapsing into anarchy."

—Ian Malcom in Michael Crichton's *Jurassic Park* sequel, *The Lost World*

By John Dix

The edge of chaos seems an apt description for the state of the network world. Despite its immense size and relative maturity, this hulking $555 billion machine is constantly choking on change, spitting out broken cogs even as massive new ones are created.

Witness the World-Wide Web phenomenon. Virtually unheard of a year ago, the Web today is heralding the era of electronic commerce, changing the way we work and threatening to fundamentally reorder the software industry.

Companies from AT&T to Zenith Data Systems are investigating or already investing in Web opportunities. The pace of change far exceeds anything that has gone before, including the PC and LAN revolutions.

And the Web represents but one of the significant developments last year, another being the ascendancy of network switching, which has already begun to pave the way for the next big change, the full-scale arrival of Asynchronous Transfer Mode.

The pace of change is such that many of the industry's biggest players practically have to remake themselves every year. Consider this: 60% of 3Com's $1.3 billion in revenue was derived from products introduced in the last 12 months, said Eric Benhamou, 3Com chairman, president and CEO, in a recent interview.

The weekly turn of events is evidence enough of the industry's vibrance. Endless product advances. The financial turns of key suppliers. The birth of vendors. The acquisition and demise of others.

But the change is perhaps best seen in numerical relief. Here, then, we present the second annual Network World 200, which ranks industry players by revenue and also serves as a tool to gauge the health of your vendors, a way to find new partners and a simple directory.

Besides providing financial data about the companies you may do business with, this $50,000 industry study includes information about how long companies have been in business, what types of products they offer, the names of company principals and company phone numbers.

The main table lists the industry's 200 largest companies based on revenue. A second chart gives bare-bones data for the 40 next largest companies, up-and-comers such as Persoft and Tivoli Systems.

The research was completed in late 1995, so the companies are ranked by 1994 revenues. Projections for 1995 are provided where available. The project was conducted by IDG Research Services, a division of International Data Group, the parent company of Network World, Inc.

Surveys were mailed to executives at 350 companies and followed up with telephone interviews. Some holes in the data were filled by obtaining information from on-line sources and others, including Investext, Dun & Bradstreet, Disclosure, Standard & Poor's, CorpTech and Wards.

This is what the research turned up: The market, based on the fortunes of the industry's 200 largest domestic network companies, totaled $483 billion in 1994, up 16% from 1993.

The industry crossed the half-trillion dollar mark in 1995, growing 15% to $555 billion. That number was extrapolated by calculating growth from 1994 to 1995 for the 156 companies for which 1995 data was available — actual data for companies

WIRED FOR GROWTH

AOL is the fastest growing company in the network world.

AOL's *Case*

While it seems that America Online has come out of nowhere to dominate the on-line scene, the company has actually been at it for more than a decade.

The fastest growing Network World 200 company from 1994 to 1995, AOL was founded in 1985 with the explicit intent of creating a mass market for on-line services.

Stephen Case, president and chief executive officer, cofounded the company and used the consumer marketing experiences he learned at PepsiCo and Procter & Gamble to storm the on-line scene. In a little more than 10 years, he has grown the company to almost 60% the size of CompuServe, the on-line pioneer that was founded more than 26 years ago.

In 1995 alone, AOL tripled its customer base to four million and grew revenue 230% to $343 million.

That growth can be attributed to the fact that Case has created remarkable brand awareness. While AOL may not be a household name yet, the company seems intent on making it one through advertising and by deluging the market with mailers that include the software necessary to join the AOL world.

edge of chaos

dollar mark, even as it reinvents itself.

whose fiscal year ended before September 1995, and estimates for others. That growth rate was then multiplied by the NW 200's 1994 revenue total.

While the 1995 estimate is only derived from a subset of the NW 200 companies, these organizations represent the bulk of the industry: the 1994 revenues for the 156 companies represent 89% of the total for that year.

What the numbers tell

Before we delve into some of the details the numbers reveal, here are a few observations about the changing market dynamics in 1995 as illustrated by the fortunes of some of the biggest players:

■ IBM is climbing back. Analysts project the company will close out 1995 with $71.4 billion in revenues — up 12% — and profits of $6.3 billion, more than twice the profits of the year before. Mainframe revenues now account for less than 9% of sales. CEO Lou Gerstner has brought financial stability back by tightening the shrouds, but the network-centric computing vision he recently trotted out may be too little, too late. Will adopting a time-worn concept pay enough dividends going forward?

■ Novell is struggling to stay buoyant by casting off ballast brought on by Ray Norda. Gone are AppWare and UnixWare, and on the block is the bulk of WordPerfect, a company that was acquired. Novell's revenues grew a meager 6% in 1995 to $2.1 billion, but management has brought the profit story around — earnings jumped 86% last year to $386 million.

■ Revenue at juggernaut Microsoft leaped 28% to $5.6 billion in 1995, while profits topped $1.4 billion. But even more amazing than Microsoft's continued double-digit growth is the unprecedented mind share the company has captured with Windows NT. Judging by the hype, NT will cure everything from database blues to depression.

■ Cisco is simply exploding in size, fired in the main by its insatiable appetite for acquisitions, most recently of the switching variety. Revenues grew 64% in 1995 to $1.9 billion, while profits shot up 34% to $421 million. The ongoing trick is to integrate the array of acquired products into a sensible lineup.

■ 3Com joined the billionaires' club for the first time last year, as did Scientific-Atlanta. 3Com's revenue jumped 57% to $1.3 billion and profits climbed to $125 million. The company prides itself on recognizing trends early and going where others have not yet gone. While Cisco and Bay focused on backbone internetworking, 3Com focused on boundary routing. While Cabletron and Bay focused on big chassis-based hubs, 3Com looked to stackables. The strategy is paying off.

Judging by these elite, it was a good year by and large. IBM is making progress, and Novell's problems are still mostly self-created — certainly not a by-product of a sour market.

The big stories

The biggest stories in this boom year were obviously the Web, the explosion in on-line activity and the move en masse to switching.

While the Web dominated the weekly news, there are relatively few standouts in terms of financial success, other than the remarkable rise of Netscape.

Netscape skyrocketed from $700,000 in revenues in 1994 to $47 million in 1995. Even more remarkable, the company's stock late in the year was bouncing around between $140 and $170 per share, giving it a market capitalization of more than $5 billion.

But with 1994 revenue at $700,000, the company doesn't make our 1994 list. And even at $47 million, it wouldn't make the NW 200 based on 1995 revenues.

Continued on page 8

FASTEST GROWING COMPANIES FROM '94-'95

1994 Revenue Rank	Company	Worldwide Revenue ($M) 1994	1995 (Estimated)	%▲ '94-'95
139	America Online	104	343	230%
147	PLATINUM Technology	96	285	198%
184	Cascade Communications	50	128	155%
194	Ascend Communications	39	95	143%
48	Frontier	985	2,100	113%
117	StrataCom	154	325	111%
173	NetManage	62	129	109%
104	Attachmate	200	400	100%
198	Hummingbird Communications	33	64	93%
91	MFS Communications	287	539	88%
67	U.S. Robotics	499	889	78%
175	PairGain Technologies	60	104	75%
102	Intuit	223	378	69%
141	Microdyne	101	170	68%

FASTEST GROWING COMPANIES FROM '90-'95

1994 Revenue Rank	Company	Worldwide Revenue ($M) 1990	1995 (Estimated)	'90-'95 CAGR*
197	Network Peripherals	0.2	53	206%
156	Auspex Systems	1.3	116	145%
91	MFS Communications	10.7	539	119%
159	Tricord Systems	2.0	88	113%
173	NetManage	3.0	129	112%
145	Cheyenne Software	3.3	126	107%
40	Cisco Systems	69.7	1,970	95%
199	McAfee Associates	2.0	48	89%
147	PLATINUM Technology	15.2	285	80%
160	Asante Technologies	4.0	61	72%
188	NetWorth	3.7	56	72%
179	VTEL	5.3	75	70%
67	U.S. Robotics	64.7	889	69%
148	FTP Software	11.1	146	68%
117	StrataCom	195	325	66%

*CAGR = Compound annual growth rate

THE 15 MOST PRODUCTIVE COMPANIES

1994 Revenue Rank	Company	Revenue/ Employee 1994
16	Compaq Computer	$758,419
186	SysKonnect	$666,667
18	Apple Computer	$629,729
112	Allied Telesyn International	$555,932
40	Cisco Systems	$528,867
27	Dell Computer	$484,950
133	Madge Networks (U.S.)	$473,684
137	Olicom USA	$463,415
102	Intuit	$461,570
46	Zenith Data Systems	$454,545
86	Standard Microsystems	$442,308
38	EMC	$430,313
72	LCI International	$421,818
37	Anixter	$414,634
47	NEC America	$412,917

Continued from page 7

More than likely, 1996 will be the year some of these Web companies begin to come into their own, but don't expect a lot more Netscapes: Besides the fact that everyone from IBM to Microsoft to Lotus has now focused full attention on the Web, many of the start-ups will be niche players. That is, after all, one of the beauties of the Web. It makes it possible for smaller firms to flourish.

Interest in the Web went hand in hand with an across-the-board surge of on-line activity. America Online (AOL) had revenues of $104 million in 1994 and was expected to close out 1995 with sales of $343 million, a jump of 230%. CompuServe didn't fare as well but turned in otherwise respectable results: 1994 revenues of $430 million were expected to grow 36% in 1995 to $583 million. Profits at both companies rose, as well — AOL leaping from $6 million to $16 million, and CompuServe going from $102 million to $150 million.

All of this on-line activity has driven sales of everything from modems, to ISDN equipment and services, to firewalls and consulting services. For example, revenues at U.S. Robotics, which makes modems, remote access devices and PCMCIA and ISDN devices, shot up 78% to $889 million last year, and 1995 profits were up 83% to $66 million.

One of the other hot developments last year was the acceptance of switching. A while in coming, switching really began to boom in 1995. One telltale sign: The flock of original switch start-ups have been all but devoured by companies such as Cisco, which acquired Grand Junction, LightStream and Kalpana.

Although too small to show up on the NW 200 radar screen this year, Plaintree Systems' growth shows why the big guys want in on this market. The switch company had $3 million in revenues in 1994 and was expected to close 1995 with sales of $27 million. Alantec — No. 213 on The Other 40 list — nearly doubled its sales from $25 million to $49 million.

Fore Systems, which differs from the other switch makers in that it has focused exclusively on ATM switching, has also benefited from the shift away from shared-media LANs. Its revenues jumped from $24 million in 1994 to $76 million last year.

Of course, much of the traditional switching business is being absorbed by the big hub and router makers, many of which flourished last year.

Cisco, as noted, continued to be the force to reckon with, although 3Com and Bay have more than held their own.

Bay, for example, grew a respectable 24% in 1995, posting sales of $1.3 billion. Profits, however, were up only 8% to $131 million, perhaps indicating that there is still work to be done integrating the former Wellfleet and SynOptics operations.

Smaller players such as CrossComm haven't done as well. The company's sales were flat last year at $50 million, although the company has narrowed its losses. After losing $12 million in 1994, CrossComm was forecast to lose $6 million in 1995.

Of the independent hub makers, Cabletron is the largest with 1995 revenues of $811 million, up 36% from the year before. Profits were up the same percentage, to $162 million. UB Networks' sales were relatively flat, growing only 3% last year to $375 million. But profits slid 25% from $19 million to $14 million.

While profits didn't actually decline at hub maker Chipcom, they didn't reflect revenue growth. Sales were forecast to go up 24% in 1995 to $331 million, but profits were expected to only climb 1% to $18 million.

Optical Data Systems fared better,

Continued on page 10

COMPANIES THAT SPENT THE MOST ON R&D IN 1995

1994 Revenue Rank	Company	1995 R&D %*
147	PLATINUM Technology	28%
185	CrossComm	26%
79	Borland International	24%
96	Alcatel Data Networks	24%
163	Centigram Communications	21%
143	Telco Systems	20%
195	Digital Link	20%
148	FTP Software	19%
49	Lotus Development	18%
117	StrataCom	18%
174	Tekelec	18%
87	Symantec	18%
36	Novell	17%
164	Eicon Technology	17%
181	Netrix	17%
118	Banyan Systems	17%
130	Dialogic	17%

*As percentage of 1995 sales.

MOST PROFITABLE COMPANIES IN 1994

1994 Revenue Rank	Company	Profits as % of 1994 Revenue
52	Wang Laboratories	60%
198	Hummingbird Communications	35%
145	Cheyenne Software	33%
90	BMC Software	29%
63	Newbridge Networks	29%
40	Cisco Systems	26%
23	Microsoft	25%
148	FTP Software	25%
164	Eicon Technology	24%
76	CompuServe	24%
44	Memorex Telex	22%
194	Ascend Communications	22%
59	Cabletron Systems	20%
14	Intel	20%

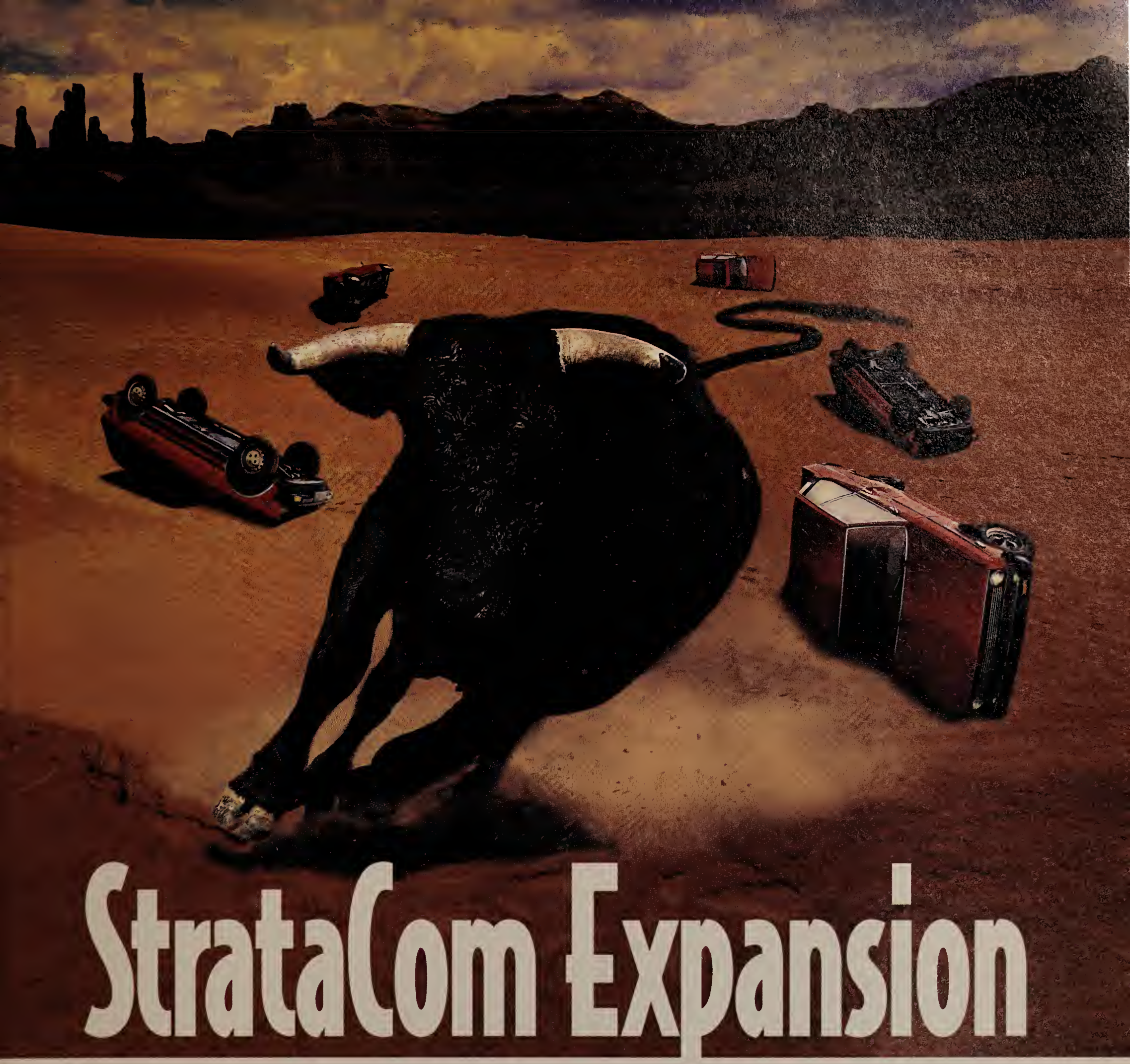
LARGEST INCREASE IN PROFITS '94-'95

1994 Revenue Rank	Company	%▲'94-'95 CAGR
199	McAfee Associates	1,140%
190	Procom Technology	278%
141	Microdyne	183%
9	NYNEX	164%
21	Unisys	158%
139	America Online	155%
77	Cray Communications	150%
184	Cascade Communications	147%
117	StrataCom	142%
78	Octel Communications	130%
158	Shiva	128%
135	Network General	125%
2	IBM	110%
102	Intuit	107%
174	Tekelec	95%

CAGR = Compound annual growth rate

LARGEST INCREASE IN PROFITS '90-'95

1994 Revenue Rank	Company	%▲'90-'95 CAGR
38	EMC	150%
63	Newbridge Networks	117%
40	Cisco Systems	98%
27	Dell Computer	94%
136	Comverse Technology	74%
69	Tellabs	69%
199	McAfee Associates	65%
67	U.S. Robotics	64%
45	DSC Communications	62%
148	FTP Software	58%
190	Procom Technology	58%
81	American Power Conversion	57%
154	Optical Data Systems	54%
120	Best Power Technology	53%
132	ADTRAN	52%



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Continued from page 8

with analysts expecting it to finish 1995 with $122 million in sales, up 41% from the year before, and profits up 72% to $14.6 million.

Demand for routers and hubs is being fed by the continued migration to LAN-based network computing environments. You don't have to look further than the fortunes of the computer makers for evidence of that.

Wall Street analysts were forecasting that Compaq, the leading supplier of LAN servers, would close 1995 with sales up 32% to $14.4 billion, surpassing Digital and making it the third largest domestic computer company behind IBM and Hewlett-Packard. (An interesting aside: This makes Compaq bigger than all but one of the Baby Bells.)

Digital, which posted a profit of $122 million in 1995 after losing $2.1 billion in 1994, put up a slim 3% growth in sales in 1995, inching up to $13.8 billion.

Data General, another long-struggling minicomputer maker, also managed to grow sales 3% to $1.2 billion. But more impressively, it reduced its losses from $88 million in 1994 to a loss of $47 million in 1995.

Ironically, minicomputer sales at IBM were up 14% last year, but they account for less than $5 billion in revenue. With sales of mainframes flat, the bulk of IBM's revenue gains are coming from sales of PCs, software and services. Now that it has acquired Lotus Development, growth this year may be fueled by sales of collaborative computing tools and electronic mail.

1995 not good for NOS players

Interestingly, whereas the purveyors of network operating systems traditionally have cashed in on the shift to PC-based network computing environments, the main NOS players didn't fare very well last year.

Novell managed only to inch sales up last year, as we saw, and Banyan Systems, which pioneered LAN directories, actually slipped a bit. Revenues at Banyan were forecast to drop 6% from $150 million in 1994 to $141 million in 1995. Analysts predicted the company would close the year barely profitable, with earnings of $500,000 compared with $5 million in 1994.

How much of Banyan's problems can be attributed to the arrival of Novell's NetWare Directory Services or the promise of a directory in Microsoft's next version of NT, code-named Cairo, is open to debate.

In fact, it is hard to judge how the fortunes of both Banyan and Novell have been affected by the meteoric rise of Microsoft's Windows NT. The companies have certainly lost some sales to NT, but more ominous is the idea that people are simply delaying LAN decisions until they see how NT shakes out. It will be some time before we can judge how NT will affect long-term efforts at Novell and Banyan.

Software companies flourishing in the network computing environment are those focused on different aspects of the client/server market. Revenues at PLATINUM Technology, for example, skyrocketed 198% in 1995 to $285 million, largely due to an ongoing acquisition binge.

The company has assembled a portfolio of client/server-based systems management, data warehousing, application development and business intelligence products.

Client/server tool suppliers Progress Software and Gupta also are racking up sales. Progress' revenues jumped 26% in 1995 to $176 million, and Gupta's sales leaped 49% to $96 million.

The wide area

All this increased client/server activity is contributing to the need to link client devices to an expanding range of corporate servers. This, in turn, is driving up the demand for WAN services such as frame relay.

The equipment vendors that seem to be capitalizing on this the most are StrataCom and Newbridge Networks. StrataCom sales were forecast to shoot up 111% in 1995 to $325 million, with profits jumping 142% to $48 million. Newbridge revenues were up 45% to $801 million, with profits growing 19% to $188 million.

Much of the success of both companies comes from equipment sales to carriers installing overlay networks to support new services such as frame relay

Continued on page 18

ALPHABETICAL COMPANY LISTING

1994 Revenue Rank	Company	1994 Revenue Rank	Company	1994 Revenue Rank	Company	1994 Revenue Rank	Company
53	3Com	162	Computer Network Technology	215	ISICAD	100	Pyramid Technology
237	Accton Technology	28	Computer Sciences	205	Lantronix	238	Racal InterLan
214	Accugraph	54	COMSAT	200	Larscom	62	Racal-Datacom
82	Adaptec	136	Comverse Technology	72	LCI International	230	RAD Data Communications
75	ADC Telecommunications	111	Consolidated Communications	206	Litton-FiberCom	182	RAM Mobile Data
60	Adobe Systems	65	Control Data Systems	49	Lotus Development	227	Remedy
132	ADTRAN	77	Cray Communications	133	Madge Networks (U.S.)	176	Retix
107	Advanced Logic Research	51	Cray Research	172	Mannesmann Tally	15	Rockwell International
213	Alantec	185	CrossComm	199	McAfee Associates	123	SAP America
96	Alcatel Data Networks	183	Cubix	191	McDATA	13	SBC Communications
112	Allied Telesyn International	161	D-Link Systems	10	MCI Communications	220	SBE
139	America Online	42	Data General	44	Memorex Telex	56	Scientific-Atlanta
73	American Management	218	Data Race	192	Memotec Communications	26	Seagate Technology
81	American Power Conversion	150	Data Switch	222	Meridian Data	158	Shiva
12	Ameritech	110	Datapoint	91	MFS Communications	50	Siemens Rolm
24	AMP	202	Davox	157	Micom Communications	121	Skytel
61	Andrew	221	Dayna Communications	177	Microcom	116	Software AG
37	Anixter	27	Dell Computer	141	Microdyne	11	Sprint
210	Apertus Technologies	240	Develcon	229	Microlog	86	Standard Microsystems
18	Apple Computer	130	Dialogic	23	Microsoft	70	Sterling Software
204	Applied Voice Technology	129	Digi International	219	MicroTel International	117	StrataCom
235	Arcada Software	8	Digital Equipment	68	Mitel	22	Sun Microsystems
138	Artisoft	195	Digital Link	4	Motorola	55	Sybase
160	Asante Technologies	134	Digital Microwave	140	Multi-Tech Systems	87	Symantec
194	Ascend Communications	45	DSC Communications	31	National Semiconductor	186	SysKonnect
89	Ascom Timeplex	88	Dun & Bradstreet Software	47	NEC America	34	Tandem Computers
122	Aspect Telecommunications	74	Dynatech	151	NetFrame Systems	174	Tekelec
30	AST Research	164	Eicon Technology	173	NetManage	39	Tektronix
1	AT&T	38	EMC	181	Netrix	143	Telco Systems
104	Attachmate	226	Equinox Systems	211	NetSoft	166	Telebit
156	Auspex Systems	180	Everex Systems	113	Network Computing Devices	41	Teleglobe
118	Banyan Systems	85	Exide Electronics	98	Network Equipment Tech	146	Telematics International
43	Bay Networks	171	Farallon Computing	135	Network General	168	Telenex
105	BBN Systems & Technologies	108	FileNet	197	Network Peripherals	119	Teleport Communications Group
80	Belden Wire & Cable	217	Fore Systems	101	Network Systems	69	Tellabs
7	Bell Atlantic	48	Frontier	188	NetWorth	106	The Santa Cruz Operation
6	BellSouth	148	FTP Software	236	New England Systems	203	The Wollongong Group
120	Best Power Technology	127	Gandalf Systems	63	Newbridge Networks	178	Thomas-Conrad
66	BICC Cables	165	GE American Comm.	20	Nortel	131	TIE/Communications
90	BMC Software	103	General DataCom	36	Novell	207	Tivoli Systems
155	Boca Research	99	Genicom	9	NYNEX	209	Transaction Network Services
126	Boole & Babbage	189	Graphnet	78	Octel Communications	159	Tricord Systems
79	Borland International	29	Graybar Electric	137	Olicom USA	67	U.S. Robotics
169	Boston Technology	92	Group Technologies	212	ON Technology	84	UB Networks
216	Brooktrout Technology	5	GTE	228	OnStream Networks	201	Unify
58	Cable & Wireless	170	Gupta	154	Optical Data Systems	21	Unisys
59	Cabletron Systems	95	Hayes Microcomputer	35	Oracle	19	US WEST
83	California Microwave	3	Hewlett-Packard	233	Orchid Technology	239	Ven-Tel
184	Cascade Communications	64	Hughes Network Systems	57	Pacific Telecom	231	Verilink
223	Castelle	198	Hummingbird Communications	17	Pacific Telesis Group	179	VTEL
224	Cayman Systems	114	Hypercom	175	PairGain Technologies	152	Walker Richer & Quinn
163	Centigram Communications	2	IBM	167	Penril DataComm Networks	142	Wall Data
145	Cheyenne Software	109	Infonet Services	232	Peregrine Systems	52	Wang Laboratories
93	Chipcom	97	Information Builders	234	Persoft	125	Wavetek
40	Cisco Systems	71	Informix Software	94	PictureTel	32	WorldCom
225	CNet Technology	153	InteCom	25	Pitney Bowes	208	XcelleNet
16	Compaq Computer	196	Integrated Network	147	PLATINUM Technology	128	Xircom
115	Compression Labs	14	Intel	190	Procom Technology	187	Xylogics
76	CompuServe	193	Interphase	124	Progress Software	144	Xyplex
33	Computer Associates International	102	Intuit	149	Proteon	46	Zenith Data Systems

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1994 Revenue Rank	1993 Revenue Rank	Company	1994 Revenue $M	1994 Revenue % int'l	1994 Profits $M	1994 Profits Profit Rank	1995 Estimated Revenue $M	1995 Estimated Revenue '94-'95 %Δ	1995 Estimated Revenue '90-'95 CAGR	1995 Estimated Profits $M	1995 Estimated Profits '94-'95 %Δ	1995 Estimated Profits '90-'95 CAGR	Number of Employees 1994	Number of Employees '94-'95 %Δ	Number of Employees '90-'95 CAGR	R&D % Rev. 1994	R&D % Rev. 1995	Pub/ Pri	Year inc.	Fiscal Year Ends	Phone
1	1	AT&T	75,094	10%	4,710.0	1	80,979	8%	5%	5,526.0	17%	9%	304,500	-1%		4%	4%	PUB	1885	12/31	212-387-5400
2	2	IBM	64,052	75%	3,021.0	2	71,481	12%	0%	6,358.0	110%	1%	219,839			7%	5%	PUB	1911	12/31	914-766-1900
3	3	Hewlett-Packard	24,991	54%	1,599.0	8	31,385	26%	18%	2,433.0	52%	27%	98,400			8%	7%	PUB	1947	10/31	415-857-1501
4	5	Motorola	22,200	56%	1,560.0	9	28,181	27%	21%	1,944.0	25%	31%	132,000	6%	7%	8%		PUB	1928	12/31	708-576-5000
5	4	GTE	20,000	13%	2,500.0	3							111,162			0%		PUB	1935	12/31	203-965-2000
6	6	BellSouth	16,845		2,159.8	5	17,638	5%	4%	(519.0)	NM	NM	92,121	-1%	-2%			PUB	1984	12/31	404-249-2000
7	9	Bell Atlantic	13,791		(754.8)	152	14,045	2%	2%	1,689.5	NM	7%	72,300	-2%	-3%			PUB	1983	12/31	215-963-6000
8	7	Digital Equipment	13,451	62%	(2,156.0)	153	13,813	3%	1%	122.0	NM	11%	77,800	-21%	-12%	10%	8%	PUB	1957	6/30	508-493-5111
9	8	NYNEX	13,307		792.6	16	13,354	0%	0%	2,090.0	164%	17%	70,562	-2%		1%		PUB	1984	12/31	212-395-0500
10	10	MCI Communications	13,300		887.0	14	15,000	13%	12%	1,041.0	17%	28%	40,667	0%				PUB	1968	12/31	202-872-1600
11	12	Sprint	12,662		890.7	13	13,687	8%	8%	947.5	6%	21%	50,000					PUB	1899	12/31	913-624-3000
12	11	Ameritech	12,570		1,687.0	6	13,345	6%	4%	2,099.0	24%	11%	63,500					PUB	1983	12/31	312-750-5000
13	14	SBC Communications	11,618		1,648.7	7							58,750					PUB	1983	12/31	210-821-4105
14	17	Intel	11,500	10%	2,288.0	4	14,975	30%	31%	3,158.0	38%	37%	32,600	0%	6%	10%	8%	PUB	1968	12/31	800-538-3373
15	13	Rockwell International	11,123	31%	634.0	17	12,885			746.1	18%	4%	79,891			5%		PUB	1928	9/30	310-797-3311
16	21	Compaq Computer	10,900	50%	867.0	15	14,360	32%	32%	1,076.6	24%	19%	14,372			2%	2%	PUB	1982	12/31	800-345-1518
17	16	Pacific Telesis Group	9,200		1,200.0	10	9,123	0%	0%	1,051.1	-12%	1%	51,590	-7%	-5%			PUB	1906	12/31	415-394-3000
18	19	Apple Computer	9,189	46%	310.0	22	11,062	20%	15%	424.0	37%	-2%	14,592			6%	6%	PUB	1977	9/30	408-974-2042
19	15	US WEST	8,998		1,175.0	11							47,493					PUB	1984	12/31	800-328-2879
20	18	Nortel	8,870		306.0	23	9,997			486.8			57,054			13%		PUB	1976	12/31	919-992-5000
21	20	Unisys	7,400	51%	100.5	38	8,410	14%	-4%	259.7	158%	NM	46,300			7%	5%	PUB	1986	12/31	215-986-4011
22	22	Sun Microsystems	4,690	51%	195.8	30	5,902	26%	19%	355.8	82%	26%	13,282	9%	5%	10%	9%	PUB	1987	6/30	415-960-1300
23	23	Microsoft	4,649	41%	1,146.0	12	5,937	28%	38%	1,453.0	27%	39%	15,017	19%	26%	13%	14%	PUB	1981	6/30	206-882-8080
24		AMP	4,030	58%	369.0	20	5,000	24%	10%	440.4	19%	9%	30,400	32%	10%	11%	12%	PUB	1941	6/30	800-522-6752
25	24	Pitney Bowes	3,543				3,511	0%		419.0			32,539				2%	PUB	1920	12/31	800-243-7650
26		Seagate Technology	3,500		225.0	28	4,500	29%	13%	260.0	16%	17%	50,000	30%		5%	5%	PUB	1979	6/30	408-438-6550
27	26	Dell Computer	2,900	18%	(29.5)	144	3,500	21%	55%	140.4	NM	94%	5,980	9%	33%	2%	2%	PUB	1988	1/31	512-728-4400
28	25	Computer Sciences	2,583	12%	95.8	39	3,600	39%	19%	110.7	16%	11%	28,600	15%	8%			PUB	1959	3/30	310-615-0311
29		Graybar Electric	2,400				2,800	17%	8%									PRI	1925	12/31	314-512-9200
30	30	AST Research	2,367	36%	31.3	60	2,468	4%	36%	(99.3)	NM	NM	6,500	0%	23%	2%	1%	PUB	1981	7/2	714-727-4141
31	27	National Semiconductor	2,295	56%	264.0	25	2,379	4%	7%	264.2	0%	NM	22,300	0%	-7%	11%	12%	PUB	1959	5/31	403-721-5000
32	33	WorldCom	2,221		(122)	150	3,639	64%	44%	267.1	NM	48%	6,000	25%				PUB	1983	12/31	601-360-8600
33	28	Computer Associates Int.	2,148	49%	401.0	19	2,623	22%	15%	431.0	7%	22%	6,900	9%	2%	10%	9%	PUB	1974	3/31	516-342-5224
34		Tandem Computers	2,108	42%	170.2	31	2,285	8%	5%	107.5	-37%	-2%	8,500	6%	-4%	13%	14%	PUB	1974	9/30	408-285-6000
35	29	Oracle	2,001	60%	283.7	24	2,967	48%	26%	441.5	56%	40%	12,058	40%	20%	10%	9%	PUB	1977	5/31	415-506-7000
36	34	Novell	1,998	43%	207.0	29	2,126	6%	16%	385.8	86%	2%	8,457	-10%		17%	17%	PUB	1983	10/31	801-429-7000
37		Anixter	1,700	30%			2,200	29%	18%				4,100	22%	11%			PUB	1957	12/31	708-677-2600
38		EMC	1,377	37%	250.7	26	1,809	31%	57%	341.3	36%	150%	3,200			9%	9%	PUB	1979	12/31	508-435-1000
39	31	Tektronix	1,325	43%	60.9	50	1,472	11%		81.3	33%		8,522	-11%		12%	11%	PUB	1946	5/31	503-627-7111
40	48	Cisco Systems	1,200	49%	314.8	21	1,970	64%	95%	421.0	34%	98%	2,269	55%	70%	7%	8%	PUB	1984	7/28	408-526-4000
41		Teleglobe	1,130		68.2	47	1,070	-5%	29%				2,100			0%		PUB	1985	12/31	514-868-8124
42	35	Data General	1,121	43%	(87.7)	147	1,159	3%	0%	(46.7)	47%	NM	5,775	-13%	-14%	8%	7%	PUB	1968	9/30	508-898-5000
43		Bay Networks	1,086	31%	120.9	34	1,342	24%	48%	130.9	8%	38%	3,247	4%		10%	10%	PUB	1994	6/30	408-988-2400
44	36	Memorex Telex	1,015	51%	227.0	27	910	-10%		(108.0)	NM		5,200	-23%		3%	2%	PUB	1987	3/31	214-444-3500
45	45	DSC Communications	1,003	26%	163.0	32	1,483	48%	23%	219.8	35%	62%	5,414			13%	13%	PUB	1976	12/31	214-519-3000
46	37	Zenith Data Systems	1,000										2,200	0%				PRI	1971	12/31	708-808-5000
47	41	NEC America	991										2,400					PUB	1963	3/1	516-753-7000
48		Frontier	985		103.0	36	2,100	113%	28%	200.0	94%	31%	4,240	75%	14%			PUB	1920	10/31	716-777-1000
49	38	Lotus Development	970	44%	85.4	41	928	-4%	6%	(7.4)	NM	NM	5,500			14%	18%	PUB	1982	12/31	617-577-8500
50	43	Siemens Rolm Com.	940										5,500	0%				PRI	1969	9/30	408-492-2000
51		Cray Research	922	47%	55.7	53	822	-11%		(8.0)	NM	NM	4,840			15%	16%	PUB	1972	12/31	612-452-6650
52	32	Wang Laboratories	855	51%	510.5	18	946	11%	-17%	(57.6)	NM	-40%	5,300	30%	-19%	5%	3%	PUB	1955	6/30	508-459-5000
53	49	3Com	827	52%	(28.7)	143	1,295	57%	25%	125.7	NM	40%	2,306	33%	9%	9%	10%	PUB	1979	5/31	408-764-5000
54	42	COMSAT	827		77.6	43	930	12%	15%	86.0	11%	NM	2,894			2%	2%	PUB	1963	12/31	301-214-3000
55	57	Sybase	826	32%	87.0	40	1,004	22%	57%	48.7	-44%	NM	4,830			14%	15%	PUB	1984	12/31	510-922-3500
56	44	Scientific-Atlanta	812	33%	35.1	58	1,147	41%	13%	63.5	81%	7%	3,673	20%	5%	7%	7%	PUB	1951	6/30	770-903-5000
57	46	Pacific Telecom	706										2,891					PUB	1955	12/31	206-696-0983
58	50	Cable & Wireless	672		61.0	49							2,400					PUB	1975	3/31	703-790-5300
59	60	Cabletron Systems	598	27%	119.2	35	811	36%	51%	162.0	36%	49%	3,663	45%	41%	11%	11%	PUB	1983	2/28	603-332-9400
60		Adobe Systems	598		6.3	102							1,584	39%	11%	3%		PUB	1982	11/30	415-961-4400
61	56	Andrew	558	44%	44.3	54	626	12%	11%	67.8	53%	20%	3,096			5%		PUB	1937	9/30	708-349-3000
62	67	Racal-Datacom	553				626	13%					2,500	60%				PUB	1950	3/31	305-846-1601
63	71	Newbridge Networks	553		157.8	33	801	45%		188.4	19%	117%	2,187	35%	19%	7%	8%	PUB	1986	4/30	703-834-3600
64	51	Hughes Network Systems	532				532	0%	20%				1,900	58%	16%			PUB	1987	12/31	301-428-5500
65		Control Data Systems	524	71%	(94.0)	149	620	18%	1%	21.7	NM	3%	2,800	-29%	-15%	3%	2%	PUB	1992	12/31	612-482-2100
66		BICC Cables	500										3,500					PUB	1984		914-353-4000
67	85	U.S. Robotics	499	16%	36.1	57	889	78%	69%	66.0	83%	64%	1,436			6%	6%	PUB	1976	9/30	708-982-5010

1994 Revenue Rank	Chair	CEO	President	Sales	Products & Services	Notes
1	Robert E. Allen	Robert E. Allen			Long-distance telecom, computer and network products and services	
2	Louis V. Gerstner Jr.	Louis V. Gerstner Jr.		Ned C. Lautenbach	Computer and network products and services	
3	Lewis E. Platt	Lewis E. Platt	Lewis E. Platt	Manuel F. Diaz	Computers, test/measurement, medical analysis products.	
4	Bill Weisz	Gary Tooker	Chris Galvin		Semiconductors, advanced electronics, wireless equip.	
5	Charles R. Lee	Charles R. Lee	Kent B. Foster		Telecom, defense communications systems & equipment	
6	John L. Clendenin	John L. Clendenin	John L. Clendenin	Charles B. Coe	Local telecom, long-distance access, wireless	
7	Raymond W. Smith	Raymond W. Smith			Local telecom, video & interactive programming	
8	Robert B. Palmer	Robert B. Palmer	Robert B. Palmer		Computer and network products and services	
9	William C. Ferguson	Ivan G. Seidenberg	Ivan G. Seidenberg	Robert T. Anderson	Local wire-line/wireless telecom, directories, info. services	
10	Bert C. Roberts Jr.	Bert C. Roberts Jr.	Gerald H. Taylor		Long-distance, global telecom & information services	
11	William T. Esrey	William T. Esrey	William T. Esrey		Global voice, data & video services and related products	
12	Richard C. Notebaert	Richard C. Notebaert			Local telecom & video communications services	
13	Edward E. Whitacre	Edward E. Whitacre		James R. Adams	Local telecom, PCS, CATV	
14	Gordon E. Moore	Andrew S. Grove	Andrew S. Grove		Semiconductors, PCs, networking	
15	Donald R. Beall	Donald R. Beall	Donald H. Davis		Factory automation equipment, fax & PC modem chipsets	
16	Ben Rosen	Eckhard Pfeiffer	Eckhard Pfeiffer	Ross Cooley	PCs, portables, LAN servers	
17	Phil Quigley	Phil Quigley	Phil Quigley	Bob Lee	Local telecom, high-speed transport, ISDN	
18	A.C. Markkula	Michael Spindler	Michael Spindler	James Buckley	Personal systems, servers, software, communications	
19	Richard D. McCormick	Solomon Trujillo	Solomon Trujillo	Catherine M. Hapka	Local telecom, video products, ISDN, Internet access	
20	Donald Schuenke	Jean Monty	Jean Monty		PBX, ATM, SONET transmission, central office equip.	Formerly Northern Telecom
21	James A. Unruh	James A. Unruh		Dewaine L. Osman	Computers, information services & systems integration	
22	Scott G. McNealy	Scott G. McNealy	Scott G. McNealy	Joe Roebuck	Workstations, network products and services	
23	William H. Gates	William H. Gates		Steve Ballmer	PC operating systems, applicationss, develop. tools	
24	James E. Marley	William J. Hudson	William J. Hudson		PC board assemblies, connectors, cabling, fiber optics	
25	George B. Harvey	George B. Harvey	George B. Harvey		Mailing systems, recording & fax systems	
26	Alan Shugart	Alan Shugart	Alan Shugart	Bernie Carballo	Disk drives, components and software	
27	Michael Dell	Michael Dell		Dick Snyder	PCs, portables, servers and peripherals	
28	William R. Hoover	Van B. Honeycutt	Van B. Honeycutt		Outsourcing, consulting, systems integration	Employment data=1991
29		Carl L. Hall	Carl L. Hall	R.A. Reynolds	LAN cards, switches, hubs, cabling, test equipment	
30	Safi Qureshey	Safi Qureshey	Safi Qureshey	Jerry Devlin	PCs, laptops, servers	
31		Gilbert F. Amelio	Gilbert F. Amelio	Patrick Brockett	Semiconductors	
32	John W. Kluge	Bernard J. Ebbers	Bernard J. Ebbers	Gregory A. LeVert	Voice, data & video telecom services	
33	Charles B. Wang	Charles B. Wang	Sanjay Kumar	Richard Chiarello	Database tools, business application software	
34	Thomas Perkins	James Treybig	James Treybig	Gerald Peterson	High-availability computers, transaction process monitors	
35	Lawrence Ellison	Lawrence Ellison	Raymond Lane	Barry Ariko	DBMS products, applications, tools	
36	Robert J. Frankenberg	Robert J. Frankenberg	Robert J. Frankenberg	Joseph Marengi	LAN operating systems, groupware, business software	
37	Bob Wilson	Bob Grubbs	Bob Grubbs	Sherwood Robins	Cabling systems, voice and data products	Subsidiary, Anixter Int'l
38	Richard Egan	Michael Ruettgers	Michael Ruettgers	John Egan	Disk array storage devices, storage mgmt. systems	
39	Jerome Meyer	Jerome Meyer	Jerome Meyer	Bob Dunne	Measurement, color printing, video systems, displays	
40	John Morgridge	John Chambers	John Chambers	Don LeBeau	Routers, dial-up servers, ATM switches, network mgmt.	
41	Charles Sirois	Charles Sirois	Andre LeBel		Telecom, frame relay, ISDN, Internet access	Canadian company
42		Ronald L.Skates	Ronald L.Skates	Joel Schwartz	Computer systems, servers, workstations, software	
43	Paul J. Severino	Andrew K. Ludwick	Andrew K. Ludwick	Gary Bowen	Hubs, routers, switches, network management	
44	Marcelo Gumucio	Marcelo Gumucio	Marcelo Gumucio	George Bennett	Servers, gateways, controllers, internet devices	
45	James L. Donald	James L. Donald	James L. Donald		Switching and transmission systems	
46	Jean-Marie Descarpentries	Jacques Noels	Jacques Noels	Clifford Jenks	PCs, laptops, servers, mobile systems	
47		Mineo Sugiyama	Mineo Sugiyama		ATM, PBX, fiber, wireless, video, satellite systems	Subsidiary, NEC Corp. (Japan)*
48	Ronald L. Bittner	Ronald L. Bittner	William Oberlin	William Oberlin	Local/long-distance telecom services	
49	Louis V. Gerstner Jr.	Michael Zisman		Deborah Besemer	Spreadsheets, E-mail, groupware, applications	Subsidiary, IBM (7/95)
50		Karl Geng	Karl Geng	Richard P. Allocco	PBXs, switching systems	Subsidiary, Siemens Nixdorf AG (Ger.)*
51	J. Phillip Samper	J. Phillip Samper	Robert Ewald	Mick Dungworth	Workload management software, supercomputers	
52	Joseph M. Tucci	Joseph M. Tucci	Donald P. Casey		Imaging software, network integration	
53	Eric Benhamou	Eric Benhamou	Eric Benhamou	Bill Marr	Routers, hubs, LAN switches, LAN adapters, modems	
54	Melvin R. Laird	Bruce L. Crockett	Bruce L. Crockett		Satellite services, telecom products, systems integration	Formerly Communications Satellite
55	Mark Hoffman	Mark Hoffman	Mark Hoffman	Bob Currie	DBMS, middleware, application dev. & end-user tools	
56	James V. Napier	James F. McDonald	James F. McDonald		Broadband telecom, satellite-based video/voice/data ntwks.	
57	Charles Robinson	Charles Robinson	Charles Robinson	Charles Robinson	Local & long-distance telecom, cellular	Unit of PacifiCorp
58		Gabriel A. Battista		C. Gibney	Switched long-distance, private-line/mnged. data, msging.	Subsidiary, Cable & Wireless Plc (GB)*
59	Craig R. Benson	S. Robert Levine	S. Robert Levine	Steven Tentindo	Hubs, routers, ATM, LAN switches, SNA, virtual networking	
60	John E. Warnock	John E. Warnock	Charles M. Geschke	Stephen A. MacDonald	Desktop publishing tools & technologies	
61	Floyd English	Floyd English	Floyd English		Microwave antenna/mobile radio systems, net products	
62	Ernest Harrison	David C. Elsbury		Henry Cheli	Modems, muxes, bridges, routers, gateways, hubs	Subsidiary, Racal Electronics Plc (GB)*
63	Terence H. Matthews	Terence H. Matthews	Peter Sommerer	F. Michael Pascoe	Multiplexers, ATM/ frame relay transmission gear	Subsidiary, Newbridge Networks Corp.
64	Jack Shaw	Jack Shaw	Pradman Kaul	Sheldon Revkin	Wireless, VSAT, LAN access, frame relay/ATM switches	Subsidiary, GM Hughes Electronics
65		James Ousley	James Ousley		Managed services, E-mail integration services	
66	Carl F. Painter	Carl F. Painter			Power cables, telephone transmission line cables	Subsidiary, BICC Plc (GB)*
67	Casey Cowell	Casey Cowell	Casey Cowell		Remote access, modems, PCMCIA, ISDN access	

1994 Revenue Rank	1993 Revenue Rank	Company	1994 Revenue $M	1994 Revenue % Int'l	1994 Profits $M	1994 Profits Profit Rank	1995 Estimated Revenue $M	1995 Estimated Revenue '94-'95 %Δ	1995 Estimated Revenue '90-'95 CAGR	1995 Estimated Profits $M	1995 Estimated Profits '94-'95 %Δ	1995 Estimated Profits '90-'95 CAGR	Number of Employees 1994	Number of Employees '94-'95 %Δ	Number of Employees '90-'95 CAGR	R&D % Rev. 1994	R&D % Rev. 1995	Pub/ Pri	Year Inc.	Fiscal Year Ends	Phone
68	59	Mitel	496	36%	20.7	65	589	19%	7%	31.8	54%	0%	3,606	-1%	-3%	7%	7%	PUB	1971	3/31	613-592-2122
69	68	Tellabs	494	35%	72.4	44	657	33%	26%	110.2	52%	69%	2,585			13%	12%	PUB	1975	12/29	708-969-8800
70	61	Sterling Software	473	26%	58.3	52							3,000			7%		PUB	1981	9/30	214-891-8600
71	64	Informix Software	469		66.2	48							2,212			13%		PUB	1980	12/31	415-926-6300
72	65	LCI International	464		38.0	56	600	29%		45.0	18%		1,100	36%	12%			PUB	1983	12/31	703-442-0220
73	63	American Management	460	20%	23.1	62	615	34%	19%	30.0	30%	26%	4,500	33%	15%			PUB	1970	12/31	703-267-8000
74	52	Dynatech	458	35%	(30.0)	145	489	7%		19.2	NM		2,860	-9%		12%	11%	PUB	1959	3/31	617-272-6100
75	62	ADC Telecommunications	449	11%	39.0	55	583	30%	18%	50.0	28%	17%	2,644	6%	6%	11%	11%	PUB	1953	10/31	612-938-8080
76	69	CompuServe	430		102.0	37	583	36%	23%	150.0	47%	30%						PUB	1969	4/30	614-457-8600
77		Cray Communications	424	40%	2.0	118	440	4%	18%	5.0	150%	NM	3,600	0%	12%	7%	7%	PUB	1947	4/30	301-317-7710
78	75	Octel Communications	406		13.5	82	473	16%		31.1	130%					1%		PUB	1982	6/30	408-321-2000
79	53	Borland International	394	49%	70.0	46	254	-36%	18%	12.0	-83%	0%	1,898	-42%	14%	17%	24%	PUB	1983	3/31	408-431-1000
80		Belden Wire & Cable	384										2,700					PUB	1993		317-983-5200
81	74	American Power Conversion	378	32%	71.3	45	520	38%	54%	87.9	23%	57%	1,990			3%	2%	PUB	1981	12/31	401-789-5735
82		Adaptec	372		58.9	51	466	25%	34%	93.4	59%	48%	1,600	25%	27%	11%	13%	PUB	1986	3/31	408-945-8600
83	72	California Microwave	369	42%	15.1	76	468	27%	26%	(7.9)	NM	NM	1,887	26%	18%	4%	6%	PUB	1987	6/30	415-596-9000
84	66	UB Networks	365	55%	18.5	71	375	3%		13.8	-25%		1,000	10%				PUB	1979	9/30	408-496-0111
85		Exide Electronics	327	19%	9.2	94	391	20%	18%	7.4	-20%	8%	1,400	-5%	0%	3%	3%	PUB	1962	9/30	919-872-3020
86	76	Standard Microsystems	322	44%	19.9	66	378	17%	37%	24.0	21%	39%	728	14%	13%	7%	7%	PUB	1971	2/28	516-435-6000
87	73	Symantec	320	34%			355	11%					1,260	54%		20%	18%	PUB	1989	3/31	408-253-9600
88		Dun & Bradstreet Software	300				350	17%					2,500	-8%				PUB	1963		404-239-2000
89		Ascom Timeplex	292	47%			310	6%	3%				1,766	-15%	-8%	14%	11%	PUB	1969		201-391-1111
90		BMC Software	288	32%	84.0	42	345	20%	32%	77.5	-8%	37%	1,000	19%	15%	16%	16%	PUB	1980	3/31	713-918-8800
91	99	MFS Communications	287		(136.1)	151	539	88%	119%				3,500					PUB	1988	12/31 4	402-977-5300
92		Group Technologies	274				300	9%					2,200	0%	20%			PUB			813-972-6477
93	95	Chipcom	268	46%	18.6	69	331	24%	58%	18.8	1%	NM	853			12%	13%	PUB	1983	12/31	508-460-8900
94	93	PictureTel	255				325	27%					950	16%				PUB	1984	12/31	508-762-5000
95	127	Hayes Microcomputer	247	13%	(12.6)	140	264	7%	15%	(5.6)	56%	NM	726	-5%	4%	6%	4%	PRI	1978	9/30	770-840-9200
96		Alcatel Data Networks	245	64%	5.0	108	279	14%		2.0	-60%		900	5%		25%	24%	PRI	1993	12/31 8	800-252-2835
97	80	Information Builders	243	35%			270	11%	7%				1,725	1%	2%			PRI	1975	12/31	212-736-4433
98	81	Network Equipment Tech.	238	22%	(6.0)	135	284	19%	9%	27.0	NM	16%	1,164	3%	-2%	14%	12%	PUB	1983	3/31	415-366-4400
99	106	Genicom	234	25%	2.6	117							2,382					PUB	1983		214-386-2000
100	78	Pyramid Technology	234										800	25%				PRI	1981	9/30	800-289-7973
101	82	Network Systems	232	41%	(23.8)	141							1,100			16%		PUB	1974	12/31	612-424-4888
102		Intuit	223		12.3	83	378	69%		25.4	107%		484			11%	14%	PUB	1983	9/30	800-624-8742
103	83	General DataComm	211	35%	(2.3)	132	215	2%	1%	(25.0)	-987%	NM	1,800	0%	-2%	9%	12%	PUB	1969	9/30	203-574-1118
104	97	Attachmate	200	30%			400	100%					1,000	100%				PRI	1984	12/31	206-644-4010
105	79	BBN Systems & Tech.	196	14%	(7.8)	136	215	10%	-4%	64.8	NM	NM	1,694	6%	-5%	11%	12%	PUB	1948	6/30	617-873-3970
106	88	The Santa Cruz Operation	184	48%	14.2	78	222	21%	16%	22.1	56%		1,150			15%	15%	PUB	1979	9/30	408-427-7100
107	91	Advanced Logic Research	183	25%	(0.3)	128	192	5%	2%	4.9	NM	-16%	500	0%	0%	2%	2%	PUB	1984	9/30	714-581-6770
108	96	FileNet	180	33%	16.1	74	223	24%	17%	22.1	37%	42%	936	15%	7%	9%	8%	PUB	1982	12/31	714-966-3400
109	77	Infonet Services	180										1,200	8%				PRI	1980	3/31	310-335-2600
110	84	Datapoint	173	95%	(93.4)	148							1,444	-31%	-11%	3%		PUB	1969	7/31	210-593-7000
111	92	Consolidated Comm.	170										1,300	0%	7%			PRI	1984	12/31	217-258-9744
112	105	Allied Telesyn International	164				200	22%					295	19%	28%			PRI	1987	12/31	800-424-4284
113	98	Network Computing Devices	161		(10.8)	137	161	0%	25%	3.3	NM	-6%	407			7%	8%	PUB	1988	12/31	415-694-0650
114	103	Hypercom	160	50%			208	30%	47%				450	33%	29%	7%	9%	PRI	1978	6/30	602-866-5399
115	147	Compression Labs	157	17%	0.1	124	204	30%	31%				549			7%	8%	PUB	1976	12/31	408-435-3000
116		Software AG	157										795					PRI	1972	12/31	703-860-5050
117	121	StrataCom	154	41%	19.8	67	325	111%	66%	48.0	142%	NM	674	56%	39%	19%	18%	PUB	1986	12/31	408-294-7600
118	102	Banyan Systems	150	19%	4.9	109	141	-6%	8%	0.5	-90%	-36%	850			17%	17%	PUB	1983	12/31	508-898-1000
119	151	Teleport Communications	150										1,113	41%	52%			PRI	1983	12/31	718-355-2000
120		Best Power Technology	149	21%	11.1	88	163	9%	16%	12.5	13%	53%	1,091	12%	12%	4%	6%	PUB	1977	12/31	608-565-7200
121		Skytel	148		27.0	61												PUB	1987	12/31	202-336-5372
122	108	Aspect Telecommunications	147	24%	17.6	72	191	30%	32%				622			11%	12%	PUB	1985	12/31	408-325-2200
123	101	SAP America	140										1,000					PUB	1988	12/31	800-872-1727
124	107	Progress Software	139	55%	14.4	77	176	26%	34%	16.7	16%	34%	962	4%	24%	15%	14%	PUB	1981	11/30	617-280-4000
125		Wavetek	135	52%	8.0	99	150	11%	20%	12.0	50%		850	-4%	10%	9%	10%	PUB	1962	9/30	619-793-2300
126	104	Boole & Babbage	132	59%	10.2	90	154	17%	11%	13.7	34%	40%	749	1%	1%	13%	11%	PUB	1967	9/30	408-526-3000
127		Xircom	131	26%	15.9	75	127	-3%	17%	(58.8)	NM	NM	350	29%	24%	9%	11%	PUB	1988	9/30	805-376-9300
128	94	Gandalf Systems	131		(47.2)	146	121	-8%	-3%	1.4	NM	NM	900			11%	8%	PUB	1970	3/31	609-461-8100
129		Digi International	131		16.7	73	165	26%	39%	19.3	16%	31%	430	41%	30%	8%	8%	PRI	1983	9/30	612-943-9020
130	193	Dialogic	127	29%	13.6	80	168	32%	29%	18.0	32%	31%	539	41%	38%	17%	17%	PUB	1983		201-993-3000
131	111	TIE/Communications	125	22%	(3.1)	133	125	0%	4%	(0.7)	77%	-40%	1,140	10%	-2%			PUB	1971	12/31	913-344-0400
132		ADTRAN	123	2%	18.6	70	163	32%	41%	25.8	39%	52%	536			15%	11%	PUB	1985	12/31	205-971-8000
133		Madge Networks (US)	117										247	50%	106%			PUB	1986	12/31	408-955-0700
134	109	Digital Microwave	116		22.5	64	154	32%	7%	2.0	-91%	-32%	538	13%	3%	7%	5%	PUB	1984	3/31	408-943-0777

1994 Revenue Rank	Chair	CEO	President	Sales	Products & Services	Notes
68	Henry Simon	John B. Millard	John B. Millard	Gregory M.E. Spierkel	PBXs, semiconductors	Canadian company
69		Michael J. Birck	Brian J. Jackman	C. Chris Cooney	Digital cross-connect systems, network access	
70	Sam Wyly	Sterling L. Williams	Sterling L. Williams		Communications/data center mgmt. software	
71	Phillip E. White	Phillip E. White	Phillip E. White	Frank Bergandi	DBMSs, tools & connectivity products	
72	H. Brian Thompson	H. Brian Thompson	Tom Wynne	Marshall Hanno	Local/long-distance telecom	
73	Charles O. Rossottti	Paul A. Brands	Philip M. Giuntini		Consulting & systems integration, custom SW	
74	Richard K. Lochridge	John F. Reno	John F. Reno		LAN/WAN, testing, frame relay, X.25 access equipment	
75	William J. Cadogan	William J. Cadogan	William J. Cadogan		Transmission and connectivity products	
76	Henry Bloch	Robert J. Massey	Robert J. Massey	Peter Van Camp	On-line information services, VAN	Subsidiary, H&R Block
77	Roger Holland	Jon Richards	Don Sullivan	Ashley Ward	Routers, switches, hubs	Subsidiary, Cray Electronics Plc (GB)*
78	Bob Cohn	Bob Cohn	Bob Cohn	Edward J. Mattinz	Voice/E-mail message servers	
79	Philippe Kahn		Gary Wetsel	Frank Vaculin	Compilers, languages, DBMS/file mgmt.	
80	C. Baker Cunningham	C. Baker Cunningham	C. Baker Cunningham	Mike Murphy	Copper/fiber-optic network cables	
B1	Rodger Dowdell			Darrell Lucente	UPSs, surge suppressors, standby power supplies	
82	John G. Adler	F. Grant Saviers	F. Grant Saviers	Martin Brauns	ATM cards, recordable CD, SCSI I/O, RAID	
83	Philip F. Otto	Philip F. Otto	Philip F. Otto		Satellite, modems, monitor/control systems	
B4	Thomas Perkins	Roel Pieper		Joel Moss	Hubs, switches, WAN connectivity, network mgmt.	Subsidiary, Tandem Computers
85	Conrad A. Plimpton	James A. Risher		Mark A. Ascolese	UPSs, network connectivity devices, power mgmt. software	
B6	Paul Richman	Paul Richman		William Rotoli	LAN adapters, hubs, LAN switches	
87	Carl Carman	Gordon E. Eubanks	Gordon E. Eubanks	John C. Laing	Remote computing, enterprise development, security	
88	John Imlay	Doug MacIntyre	Doug MacIntyre	Ken Walters	Financial, decision support, HRM, mfg., distribution software	Subsidiary, Dun & Bradstreet
89	Fred Sutter	Randy Phillips	Randy Phillips	Rick MacPherson	Multiplexers, bridges, routers, gateways	Subsidiary, Ascom AG (Switzerland)*
90	Max Watson	Max Watson	Max Watson	Rick Gardner	DBMS, network mgmt., data compression, appl. mgmt.	
91	James Q. Crowe	James Q. Crowe	Royce J. Holland		Local telecom, facilities management, systems integration	
92	Jeffery T. Gill	Carl McCormick	Carl McCormick	Jack Calderon	Contract manufacturing, design engineering	
93		Rob Held	Rob Held	Bruce L. Cohen	Hubs, bridges, routers	Subsidiary, 3Com (10/95)
94		Norm Gaut	Norm Gaut	Steve Crummey	Videoconferencing equipment	
95	Dennis C. Hayes		Dennis C. Hayes	Gary Franza	Fax/modems, fax/modem boards	
96	Jacques Dunogue	F. Joseph Reid	F. Joseph Reid	John Olson	ATM/frame relay/X.25/LAN switches	Sprint/Alcatel (France) venture
97	Gerald D. Cohen	Gerald D. Cohen	Gerald D. Cohen	David Kemler	Compilers, DBMS, design/testing software	
98	John B. Arnold	Joseph Francesconi	Joseph Francesconi	Ed Peverell	Multiplexers, WAN access equipment	
99	Don Ackerman	Paul Winn	Lee Chu	Steven Recker	Baseline inventory & performance monitoring/mgmt.	
100	Richard H. Lussier	John S. Chen	John S. Chen	Mitchell Mandich	Massively parallel processing systems, servers	Subsidiary, Siemens Nixdorf (Ger.)
101	Ryal Poppa	Ryal Poppa	Ryal Poppa	John Williams	Security, backup, hubs, switches, bridges, routers	Subsidiary, Storage Tek
102	Scott Cook	William V. Campbell	William V. Campbell	John Monson	Acctg./finance, home/entertainment, personal info. mgrs.	
103	Charles P. Johnson	Charles P. Johnson	Ross A. Belson	V. Jay Damiano	Multiplexers, ATM switches, internet products	
104	Frank Pritt	James D. Lindner	James D. Lindner	Barry Horn	Connectivity, Internet remote access, gateways, groupware	
105	Stephen Levy	George Conrades	David Campbell	Gary Phillips	Network integration, routers, security, Internet services	Division, BBN Corp.
106	Lars Turndal	Alok Mohan	Alok Mohan	Ed Adams	Integration products, Unix OSs/tools	
107	Gene Lu	Gene Lu	Gene Lu	David Kirkey	Multiprocessors, desktop computers, single & dual servers	
10B	Ted Smith	Ted Smith	Ted Smith	Lawrence S. Jordan	Optical jukeboxes, text/image, workflow	
109	Jose A. Collazo		Jose A. Collazo	John Hoffman	Messaging, managed network services	
110	Asher B. Edelman	Asher B. Edelman	Doris Benesik	Michael Black	Videoconferencing systems, data & application services	
111	Richard A. Lumpkin	Robert Currey	Robert Currey		Priv. lines, mobile cellular, local paging, long-distance svc.	Parent of Consolidated Network
112	Takayoshi Oshima	Takayoshi Oshima	Anthony Russo	Lisa Economy	Local bridges, Ethernet cards, transceivers, hubs, repeaters	Formerly Allied Telesis
113	Edward F. Staiano	Edward L. Marinaro	Edward L. Marinaro		X-terminals, PC-X software, Internet access software	
114	George R. Wallner	Al Irato	Al Irato	Charles Hellquist	Hybrid routers, point-of-sale terminals & printers	
115	John E. Tyson	John E. Tyson	John E. Tyson		Videoconferencing systems	
116	Peter Schnell	Michael J. King	Michael J. King	Dan Gillis	Data mgmt., appl. engineering, distrib. cmpting., query/rptng.	Subsidiary, Software AG (Ger.)*
117	Richard Moley	Richard Moley	Richard Moley	Geof Kirsch	Multiplexers, network management, networking software	
118	David C. Mahoney	David C. Mahoney	David C. Mahoney	John Curtis	LAN network operating systems, rules-based E-mail	
119	Robert Annunziata	Robert Annunziata	Robert Annunziata	Stuart Mencher	Local telecom, value-added network services	
120	Michael D. Lockhart	Michael D. Lockhart	Gurcharn Dang	Brian Crowe	Power mgmt., UPS, standby/conditioners/suppressors	Subsidiary, General Signal (6/95)
121	John N. Palmer	John N. Palmer	M. Bernard Puckett	Raymond O'Brien	Two-way messaging service	Subsidiary, MTel
122	Jim Carreker	Jim Carreker	Dennis Haar	Joe Schuder	Call center, auto call distributors, computer telephony	
123			Klaus Besier	Klaus Besier	Client/server financial planning & analysis software	Subsidiary, SAP AG (Ger.)*
124			Joseph W. Alsop	Cary L. Johnson	Application development tools, relational DBMS	
125	Terence J. Gooding	Terence J. Gooding	Terence J. Gooding	Ben J. Constantini	Wireless LAN, cellular test/calibration equipment	
126	Franklin P. Johnson	Paul E. Newton	Paul E. Newton	Timothy A. Dreisbach	Networking, data center management software	
127	Dirk Gates	Dirk Gates	Dirk Gates	Jerry Ulrich	Network adapters, modems, wireless LANs	
12B	Thomas A. Vassiliades	Thomas A. Vassiliades	Thomas A. Vassiliades	Paul Beaumont	Bridges, routers, ISDN/frame relay/remote access products	Canadian company
129	Robert E. Lee	Ervin F. Kamm Jr.	Ervin F. Kamm Jr.	Dana Nelson	Remote access products, bridges, communications boards	
130	Nick Zwick	Howard Bubb	Howard Bubb	John Alferi	Digital signal processing, advanced intelligent networks	
131		Charles B. McNamee	Charles B. McNamee	Stephen L. Ward	Key systems, PBXs, voice response systems, videoconferencing	
132	Mark C. Smith	Mark C. Smith	Mark C. Smith	John Jurenko	Telcom equipment, terminal adapters, DSUs/CSUs	
133	Robert Madge	Robert Madge	Marc Jones	John Butler	LAN switches, stackable hubs, ntwk. mgmt., adapter cards	Subsidiary, Madge Networks NV (Neth.)
134	Clifford H. Higgerson	Charles D. Kissner	Charles D. Kissner		Transmission equipment	

1994 Revenue Rank	1993 Revenue Rank	Company	1994 Revenue $M	1994 Revenue % Int'l	1994 Profits $M	1994 Profits Profit Rank	1995 Estimated Revenue $M	1995 Estimated Revenue '94-'95 %Δ	1995 Estimated Revenue '90-'95 CAGR	1995 Estimated Profits $M	1995 Estimated Profits '94-'95 %Δ	1995 Estimated Profits '90-'95 CAGR	Number of Employees 1994	Number of Employees '94-'95 %Δ	Number of Employees '90-'95 CAGR	R&D % Rev. 1994	R&D % Rev. 1995	Pub/ Pri	Year Inc.	Fiscal Year Ends	Phone
135	114	Network General	115	22%	11.3	87	140	22%	35%	25.4	125%	34%	550	27%	41%	13%	14%	PUB	1986	3/31	415-473-2000
136	124	Comverse Technology	114	56%	12.1	84	144	26%	54%	16.0	32%	74%	822	22%	46%	11%	14%	PUB	1984	12/31	516-677-7200
137		Olicom USA	114	50%	10.1	91	128	12%		13.0	29%		246	42%	49%	7%	8%	PUB	1991	12/31	214-423-7560
138	115	Artisoft	107		13.6	81	84	-22%	32%	(5.8)	NM	NM	550	5%		5%	9%	PUB	1982	6/30	520-670-7100
139		America Online	104		6.2	103	343	230%		15.8	155%		1,099	127%	101%	4%	4%	PUB	1985		703-448-8700
140	113	Multi-Tech Systems	103	33%			125	21%	16%				320	9%				PRI	1970	12/31	612-785-3500
141		Microdyne	101	29%	4.6	111	170	68%	37%	13.0	183%	33%	400	50%	43%	4%	3%	PUB	1984	9/30	703-329-3700
142		Wall Data	101	23%	14.2	79							654			14%		PUB	1982	12/31	206-814-9255
143		Telco Systems	100		4.7	110	89	-11%		0.6	-87%	-40%	443	-2%	2%	16%	20%	PUB	1983	8/30	617-551-0300
144	120	Xyplex	100		9.7	92	134	34%	36%	14.4	48%	34%	440			14%	13%	PUB	1981	12/31	508-952-4700
145		Cheyenne Software	98		32.5	59	126	29%	107%	27.9	-14%	NM	500			12%	12%	PUB	1983	6/30	516-484-5110
146	157	Telematics International	97	54%	11.8	85							553			17%		PRI	1982	12/31	305-772-3070
147		PLATINUM Technology	96	21%	(3.2)	134	285	198%	80%	(16.5)	-416%	NM	613	259%	99%	29%	28%	PUB	1987		708-620-5000
148	134	FTP Software	93	44%	22.9	63	146	57%	68%	31.6	38%	58%	491	38%		24%	19%	PUB	1986	12/31	508-685-4000
149	110	Proteon	93	43%	(0.0)	127							500	-35%	-4%	12%		PUB	1974	3/31	508-898-2800
150	112	Data Switch	91	21%	3.0	116							452			12%		PUB	1977	12/31	203-926-1801
151	126	NetFrame Systems	89	16%	5.7	104	117	31%	61%	8.6	50%	NM	295	2%	22%	13%	12%	PUB	1987	12/31	408-474-1000
152	128	Walker Richer & Quinn	89	28%									392					PRI	1981	12/31	206-217-7500
153	118	InteCom	88										650	0%	10%			PRI	1979	12/31	214-447-9000
154	137	Optical Data Systems	87	10%	8.5	96	122	41%	26%	14.6	72%	54%	275			9%	8%	PUB	1983	12/31	214-234-6400
155	129	Boca Research	84	16%	5.7	105	129	54%	52%	9.7	70%	37%	265	19%	42%	2%	2%	PUB	1985	12/31	407-997-6227
156	122	Auspex Systems	83	26%	8.3	98	116	39%	145%	12.4	49%	12%	323	23%	50%	13%	13%	PUB	1987	6/30	408-986-2000
157	116	Micom Communications	81	35%	5.1	107	88	9%		7.2	41%		393	8%		10%	10%	PUB	1973	3/30	805-583-8600
158	160	Shiva	81	54%	3.9	114	112	38%	19%	8.9	128%	45%	440	13%		12%	12%	PUB	1985	12/31	508-788-3061
159	119	Tricord Systems	81	25%	2.0	119	88	9%	113%	1.4	-31%	NM	261	-16%	23%	9%	8%	PUB	1987	12/31	612-557-9005
160		Asante Technologies	80				61	-24%	72%									PUB	1988	9/30	408-435-8388
161		D-Link Systems	80										550					PRI	1985	12/31	714-455-1688
162	138	Computer Network Tech.	80	28%									338			14%		PUB	1983	12/31	612-797-6000
163	131	Centigram Communications	79		7.7	100	68	-14%	22%	(2.3)	NM	63%	319			16%	21%	PUB	1980	10/31	408-944-0250
164	130	Eicon Technology	78	66%	19.0	68	99	26%		20.0	5%		530	5%		19%	17%	PUB	1984	6/30	214-239-3270
165	89	GE American Comm.	78										500					PUB	1986	12/31	609-987-4000
166	117	Telebit	76	50%	(1.6)	131							280			12%		PUB	1982	12/31	508-441-2181
167	135	Penril DataComm Networks	74	22%	1.5	122							403			12%		PUB	1968	7/31	301-417-0552
168	123	Telenex	72	11%			81	13%	8%				418	4%	-0%			PUB	1983	12/31	609-234-7900
169		Boston Technology	70	20%	6.7	101	89	27%	29%	12.9	93%	47%	323	27%	15%	21%	15%	PUB	1986	1/31	617-246-9000
170	136	Gupta	65		(23.9)	142	96	49%		(1.8)	92%		400			17%	16%	PUB	1984	12/31	415-321-9500
171	169	Farallon Computing	62				57	-8%					250	-8%				PRI	1986	9/30	510-814-5100
172		Mannesmann Tally	62										300	0%	0%			PRI	1948	12/31	800-843-1347
173		NetManage	62	21%	0.0	126	129	109%	112%	29.6	NM	NM	195	156%	151%	4%	16%	PUB	1990	12/31	408-973-7171
174	144	Tekelec	61	41%	4.4	112	78	28%	13%	8.6	95%	11%	310			20%	18%	PUB	1971	12/31	818-880-5656
175	152	PairGain Technologies	60		8.5	97	104	75%		15.9	87%		330	21%		10%	10%	PUB	1993	12/31	714-832-9922
176	133	Retix	59	54%	(11.9)	138	74	25%	5%	2.0	NM	32%	350			19%	16%	PUB	1985	12/31	310-828-3400
177	125	Microcom	56	22%	10.9	89	75	34%	5%	5.0	-54%	-8%	232	19%	0%	14%	12%	PUB	1980	3/31	617-551-1000
178	139	Thomas-Conrad	55										200					PUB	1985	12/31	512-433-6000
179	158	VTEL	54	13%	0.1	125	75	38%	70%	5.0	NM	NM				16%	14%	PUB	1985		512-314-2700
180		Everex Systems	53															PRI	1993	8/31	510-498-1111
181	171	Netrix	52	55%	(0.6)	130	62	19%	37%	3.7	NM	NM	294			8%	17%	PUB	1985	12/31	703-742-6000
182	223	RAM Mobile Data	52										300	0%				PRI	1990	12/31	800-726-3210
183		Cubix	52	6%			61	18%	44%				174	15%	18%			PRI	1979	12/2	702-888-1000
184		Cascade Communications	50	20%	9.3	93	128	155%		23.0	147%	NM	232	83%	235%	15%	15%	PUB	1990	12/31	508-692-2600
185	146	Xylogics	50	36%	3.4	115	65	30%	16%	(1.4)	NM	18%	212	18%	5%	11%	11%	PUB	1985	10/31	617-272-8140
186	142	CrossComm	50	13%	(12.2)	139	50	0%	66%	(6.0)	51%	NM	340	10%	50%	25%	26%	PUB	1987	12/31	508-481-4060
187	140	SysKonnect	50										75	33%				PRI	1991	12/31	408-437-3800
188	162	NetWorth	49	10%	1.9	120	56	14%	72%	(22.9)	NM	NM	161	38%	46%	6%	8%	PUB	1985	6/30	214-929-1700
189		Procom Technology	45	13%	1.8	121	75	67%	32%	6.8	278%	58%	135	22%	16%	2%	2%	PRI	1987	7/31	714-852-1000
190	145	Graphnet	45										150	0%				PRI	1968	12/31	201-837-5100
191	154	McDATA	43													20%	6%	PRI	1982	12/31	303-460-9200
192	149	Memotec Communications	41										300					PUB	1994	12/31	514-738-4781
193	150	Interphase	40	18%	(0.4)	129	45	13%	10%	2.0	NM	NM	200	0%	2%	20%	16%	PUB	1974	10/31	800-327-8638
194	188	Ascend Communications	39	20%	8.7	95	95	143%	353%	14.9	71%	NM	115			9%	10%	PUB	1989	12/31	510-769-6001
195	173	Digital Link	35	30%	4.4	113	50	42%	43%	6.1	39%	44%	187			21%	20%	PUB	1985	12/31	408-745-6200
196		Integrated Network	35										130					PRI	1985	12/31	800-345-3279
197	201	Network Peripherals	34	15%	5.7	106	53	59%	206%	8.8	54%	NM	91	37%	66%	10%	10%	PUB	1989	12/31	408-321-7300
198		Hummingbird Comm.	33		11.4	86	64	93%		20.3	78%		130	35%				PUB	1984	9/30	416-496-2200
199		McAfee Associates	33		1.0	123	48	45%	89%	12.4	1,140%	65%	128	115%	62%	12%	14%	PUB	1989		408-988-3832
200	148	Larscom	32										205	-2%	4%			PRI	1970	12/31	408-988-6600

Footnotes: **NM** = Not measurable **CAGR** = Compound-annual-growth rate *US-based operations only

1994 Revenue Rank	Chair	CEO	President	Sales	Products & Services	Notes
135	Harry Saal	Leslie G. Denend	Leslie G. Denend	Dick Lewis	Network analyzers, network management	
136	Kobi Alexander	Kobi Alexander	Kobi Alexander	Brian Wiltshire	Voice mail systems	
137	Lars Stig Nielson	Max Jensen	Max Jensen	Wilson Prokosch	Adapters, hubs, bridges, mobile products	Subsidiary, Olicom A/S
138	Gary Liebl	William Kelper	William Kelper	Bryan Moynahan	Peer-to-peer LANs, boards, servers, net management	
139	James Kimsey	Steve Case	Ted Leonsis	David Cole	On-line service, PC communications utilities	
140	Raghu Sharma	Raghu Sharma	Raghu Sharma	Thomas Heimerman	Modems, servers, multiplexers, communications software	
141	Philip T. Cunningham	Philip T. Cunningham	Philip T. Cunningham	R. Dale D'Alessio	LAN adapters, concentrators, remote access, switches	
142		James Simpson	John Wall	Dick Doer	PC-to-host connectivity software & associated tools	
143	Steward S. Flaschen	John A. Ruggiero	William B. Smith	Bill Waters	Broadband access and bandwidth optimization products	
144		Peter Nesbeda	Peter Nesbeda	Greg Ferguson	Remote access products, routers, hubs, mgmt. apps.	Subsidiary, Raytheon
145	Rei Jane Huai	Rei Jane Huai	Rei Jane Huai	Alan Kaufman	Data storage & security management	
146	John Pitt	William Hightower	William Hightower		Frame relay, ATM and dial access products	Subsidiary, ECI Telecom
147		Andrew J. Filipowski	Andrew J. Filipowski	Tom Slowey	Systems mgmt., data warehousing, app. dev, DBMS	
148		David H. Zirkle	David H. Zirkle	Penny Leavy	Internet/E-mail, Web products, remote access suites	
149	Howard Salwen	Daniel J. Capone Jr.	Daniel J. Capone Jr.	Bruce W. Lichorowic	LAN cards, hubs, routers, switches and remote access	
150	William J. Lifka	William J. Lifka	James Whittle	Anthony J. Fusarelli	Channel extension, ESCON, switches, hubs	
151	Carl Amdahl	Bob Puette	Bob Puette	John Van Siclen	Superservers	
152			Doug Walker	Kevin Klustner	Terminal emulation, computer links, graphics/GUI	
153		George Platt	George Platt	John McDonald	PBXs, LAN internetwork products	Subsidiary, Matra Hachette (France)
154	G. Ward Paxton	G. Ward Paxton	G. Ward Paxton	Joe Tucker	ATM/FDDI/Ethernet/token-ring hubs, routers, switches	
155	E. Roe Stamps IV	Anthony F. Zalenski	Anthony F. Zalenski	Jerry Edwards	Datacom, multimedia, networking, video graphics	
156	Laurence Boucher	Laurence Boucher	Bruce M. Moore	James Lawson	LAN servers	
157	Barry Phelps	Barry Phelps	Gil Cabral	Gil Cabral	Routers, multiplexers, hubs	
158	Frank Ingari	Frank Ingari	Frank Ingari	Woody Benson	Bridges, routers, gateways, server-sharing units	
159	Yuval Almog	John Mitcham	John Mitcham	John Crawford	Superservers, network software	
160	Jeff Lin/ Wilson Wong	Jeff Lin	Jeff Lin	Don Miller	Hubs, Ethernet cards, network management software	
161	Ken Kao	Ken Kao	Roger Kao		Server sharing, PC boards, network hardware/software	
162		C. McKenzie Lewis III	C. McKenzie Lewis III	Richard Helgeson	Computer-to-computer links, network software	
163		George Sollman	George Sollman	Peggy Cuggino	Voice, fax, text, data & E-mail messaging	
164	Peter Brojde	Peter Brojde	Peter Brojde	Mark Popkiewicz	Terminal emulation, interconnect servers	Div. of Eicon Technology Corp. (Can)
165		John Connelly	John Connelly	Andreas Georghiou	Satellite transmission service	Subsidiary, General Electric
166		James D. Norrod	James D. Norrod	Mark R. Wilson	Modems, remote access products	
167	Henry D. Epstein	Henry D. Epstein			LAN mgmt., power supplies, wireless, instrumentation	
168		Robert Coackley	Robert Coackley	Kirby Holmes	Network switching/diagnostics, tech. control	Subsidiary, General Signal
169	Greg C. Carr	John C.W. Taylor	John C.W. Taylor	Francis E. Girard	Network-based voice & information processing systems	
170	Umang Gupta	Umang Gupta	Sam Inmann	Michael Keddington	Client/server database, application development/deployment	
171	Reese Jones	Alan Lefkof	Alan Lefkof	Tom Skoulis	LAN/WAN connectivity, mobile computing, help desk, routers	
172	William Munro	William Munro	William Munro	Richard Waddell	Plotters, printers	Subsidiary, Mannesmann AG (Ger)*
173	Zvi Alon	Zvi Alon	Zvi Alon	Zvi Alon	TCP/IP protocol stacks, terminal-emulation software	
174	Jean-Claude Asscher	Philip J. Alford	Philip J. Alford	Anders Hultin	Diagnostic, switching products	
175	Charles S. Strauch	Charles S. Strauch	Howard S. Flagg		HDSL carrier, HDSL campus products	
176	Steve Frankel	Joe Stephan	Joe Stephan	Steve Rizzone	Hubs, routers, multiplexers	
177	James M. Dow	Roland D. Pampel	Roland D. Pampel	William Andrews	Remote access software, modems, bridges, routers	
178		Robert Vieau	Robert Vieau	Gail Daniels	LAN adapters, hubs, network management software	Subsidiary, Compaq Computer (10/95)
179	E.H. (Dick) Moeller	E.H. (Dick) Moeller	Glenn A. Pierce Jr.	Clayton Reed	Multimedia, videoconferencing	
180	Cher Wang	Cher Wang	Peter Ow		PCs, notebooks, peripherals	Subsidiary, Formosa Plastics
181		Chuck Stein	Chuck Stein	John Mullaney	Wide-area network equipment	
182	Michael Kulukundis	William Lenahan	William Lenahan	William Lenahan	Wireless data communications services	Subsidiary, Ram Broadcasting
183		Don Lehr		Jerry Soma	Single-board computers/servers; other network services	
184	Victoria Brown	Daniel Smith	Daniel Smith	Michael Champa	Multiservice WAN & ATM switches	
185	Frank Pipp	Bruce Sachs	Bruce Sachs	Grace Carr	Remote access products	
186	Tadeusz Witkowicz	Tadeusz Witkowicz	Tadeusz Witkowicz	Alain Daste	Internetworking routers & switches	
187			Michael R. Coker	Michael E. Paluzzi	Network cards, switches, concentrators	
188	John McHale	John McHale	John McHale	Terry Lee	Routers, hubs, network cards, network software	
189			Alex Razmjoo	Nick Shahrestany	RAID/hard drives/tape/CD storage devices	
190		Yaakov Elkon	Yaakov Elkon	Lawrence Bellman	X.25 and frame relay products, fax networks/switches	
191	John F. McDonnell	John F. McDonnell	John F. McDonnell	Rory Enright	Data center network swtiches	
192	Richard Drouin	Marco M. Genoni	Marco M. Genoni	Jim S. Kennedy	LAN connectivity, frame relay, switches, modems	Canadian company
193	R. Stephen Polley	R. Stephen Polley	R. Stephen Polley	Jim Gleason	LAN hubs, network interface cards	
194		Mory Ejabat	Mory Ejabat	Michael Hendren	Videoconferencing, remote access, WAN access switches	
195	Vinita Gupta	Vinita Gupta	Daniel Palmer	Timothy Montgomery	DSUs/CSUs, SMDS access devices, multiplexers	
196		Yo-Sung Cho	Yo-Sung Cho	Len Eisenstein	Central office, video on demand, access gateways/prods.	
197	Paul C. Ely Jr.	Pauline Lo Alker	Pauline Lo Alker	Mark Smith	Switching hubs, server cards, network repeater hubs	
198	Fred Sorkin	Fred Sorkin	Fred Sorkin	Jan Adamek	Text/image management, graphics/GUI software mgmt.	Canadian company
199	Bill Larson	Bill Larson	Bill Larson	Dennis Cline	Configuration tools, security/network asset management	
200		Deborah Soon	Deborah Soon	George Donohoe	High-speed WAN access equipment	Subsidiary, Axel Johnson

Continued from page 10

and ATM.

The carriers themselves were relatively quiet last year, seemingly too busy building out frame relay networks and fighting regulatory battles to launch many initiatives.

Sales up for The Big Three

Nonetheless, AT&T, MCI and Sprint all experienced healthy growth.

AT&T sales were forecast to climb 8% to $80.9 billion. That 8% represents $5.9 billion in growth, which is roughly equivalent to Microsoft's total revenues for the year. Profits were expected to leap 17% to $5.5 billion.

MCI was expected to close 1995 with $15 billion in sales, up 13% over 1994, and profits of $1 billion, up 17%. Revenue at Sprint climbed 8% to $13.6 billion, with profits of $947 million.

Results for the local Bell companies ranged all over the place, some growing 6% and some not showing any revenue growth at all — about what you would expect from regulated monopolies.

Interestingly, 12 years after divestiture, AT&T and most of the Bell operating companies are still scaling back head count.

At the end of 1983, the Bell system employed just over one million people. Today, AT&T and the seven regional Bell companies employ about 700,000, and most of the companies are still shrinking.

Pacific Telesis' employee roster, for example, was down 7% last year. AT&T and many of the others were down one or two percentage points.

Ameritech, perhaps the company most serious about local-loop competition, actually added bodies, with its head count climbing 2% to 61,144.

While still gnat-like compared to the big Bell companies, the upstart competitive access providers (CAP) are enjoying strong revenue growth.

Sales at MFS Communications, as an example, shot up 119% last year to $539 million. And Teleport was expected to close 1995 with a total $185 million in revenues.

Life for these feisty CAPs must certainly be like living at the edge of chaos, fighting as they must with seemingly omnipotent Bell companies, old-line public utility commissions and all those helpful folks in Washington.

For as fast as some types of change come to the $555 billion network machine, such as the rise of the Web, other change starts out more slowly.

Once started, however, look out. Telecommunications reform, which promises to lift many of the rules holding back the CAPs *and* the local Bell companies, could redefine chaos as we have come to know it. ■

THE LEADERS IN OVERSEAS SALES

1994 Revenue Rank	Company	% International Revenue 1995 (Estimated)
96	Alcatel Data Networks	69%
8	Digital Equipment	64%
84	UB Networks	61%
126	Boole & Babbage	60%
136	Comverse Technology	58%
31	National Semiconductor	57%
53	3Com	54%
35	Oracle	52%
52	Wang Laboratories	52%
44	Memorex Telex	52%

THE OTHER 40: THE UP AND COMERS

1994 Revenue Rank	1993 Revenue Rank	Company	1994 Revenue $M	Number of Employees 1994	Year Inc.	Phone	President	Products & Services
201		Unify	31	187	1980	408-467-4500	Reza Mikailli	RDBMS, application development tools, 4GL
202	153	Davox	30	151	1981	508-952-0200	Alphonse M. Lucchese	Unified call center products
203	179	The Wollongong Group	30	180	1980	415-962-7100	Herb Martin	Internet access and TCP/IP connectivity software
204	176	Applied Voice Technology	29	99	1982	206-820-6000	Richard J. LaPorte	Call processing, messaging, computer/telephone integration
205		Lantronix	28	48	1989	714-453-3990	Brad Freeburg	Switches, print/terminal servers, repeaters, hubs, analyzers
206		Litton-FiberCom	27	220	1982	703-342-6700	Alton J. Brann	Fiber-optic network systems
207	225	Tivoli Systems	27	201	1989	512-794-9070	Franklin Moss	Data center management software, printer utilities
208		XcelleNet	27	179	1986	770-804-8100	John C. Bacon	Enterprisewide remote & mobile computing
209		Transaction Network Services	27	82	1990	703-742-0500	John J. McDonnell	Datacom services, transaction-oriented applications
210		Apertus Technologies	26	265	1979	612-828-0300	Robert D. Gordon	Communications software, systems mgmt, data integration tools
211	175	NetSoft	26	124	1980	714-753-0800	Isaac Kong	PC-to-mid-range/mainframe connectivity
212	211	ON Technology	26	186	1985	617-374-1400	Chris Risley	Groupware applications, workgroup utilities software
213	192	Alantec	25	100	1987	408-955-9000	George Archuleta	Test equipment, LAN hubs, network software
214		Accugraph	25	115	1971	915-581-1171	Dennis McGinn	Network information, communications engineering software
215		ISICAD	24	200	1987	714-533-8910		CAD, database, network software
216	186	Brooktrout Technology	24	67	1984	617-449-4100	Eric Giler	Fax boards, fax/voice processing, fax routers
217	220	Fore Systems	24	165	1990	412-772-6600	Onat Menzilcioglu	ATM switches, cards, video adapters, management software
218		Data Race	23	170	1983	210-558-1900	Ben Barker	Multiplexers, custom PCMCIA modems
219	167	MicroTel International	22	148	1984	408-435-8520	Henry Mourad	Terminal adapters, DDS & ISDN testing, modems
220	165	SBE	22	165	1961	800-925-2666	Bill Heye	Routers, network cards, network mgmt., network software
221	159	Dayna Communications	21	130	1984	801-269-7200	K. Brad Romney	PC cards, wireless LANs, Ethernet cards & hubs
222	174	Meridian Data	21	85	1986	408-438-3100	Gianluca Rattazzi	Network software and servers
223	182	Castelle	20	68	1986	408-496-0474	Jerome Burke	Network fax, image, print software & hardware
224	196	Cayman Systems	20	50	1987	617-932-1100		Workgroup routers, remote access servers, hubs, gateways
225		CNet Technology	20	48	1987	408-954-8000	Simon Chang	Network cards, bridges, hubs
226	184	Equinox Systems	20	102	1983	305-746-9000	William Dambrackas	Servers, Unix/LAN remote access
227	224	Remedy	20	129	1990	415-903-5200	Larry Garlick	Help desk software
228	190	OnStream Networks	19	55	1989	408-727-4545	James Mongiello	Broadband wide-area network & access products
229	178	Microlog	19	250	1969	301-428-9100	Richard A. Thompson	Voice processing
230	187	RAD Data Communications	18	37	1981	201-529-1100	Amnon Presler	Frame relay, remote access, modems, DSUs/CSUs
231	191	Verilink	18	150	1987	408-945-1199	Leigh S. Belden	Integrated access devices, T-1/E-1 multiplexers, DSUs/CSUs
232		Peregrine Systems	17	111	1981	619-481-5000	John Woodall	Help desk/data center management software
233	132	Orchid Technology	17	100	1982	510-683-0300	Greg Reznick	Audio cards, graphic accelerators, system boards
234	212	Persoft	16	125	1982	608-273-6000	Tom Wolfe	Bridges, concentrators, gateways, interfaces, switches
235		Arcada Software	16	140	1994	407-333-7500	Kevin Azzouz	Enterprise data protection & storage management software
236		New England Systems	16	71	1986	617-672-8400	Peter C. Cowie	Consulting, systems integration, network monitoring
237	189	Accton Technology	15	25	1988	408-452-8900	Swan Chen	Internetwork products
238		Racal InterLan	15	100	1994	800-526-8255	Peter Gyenes	Network interface cards
239	183	Ven-Tel	15	36	1977	408-436-7400	M. Sue McVicker	Modems
240	199	Develcon	14	135	1974	306-933-3300		Bridges, routers, hubs, switches, ISDN/frame relay access prods.

Happy New Year

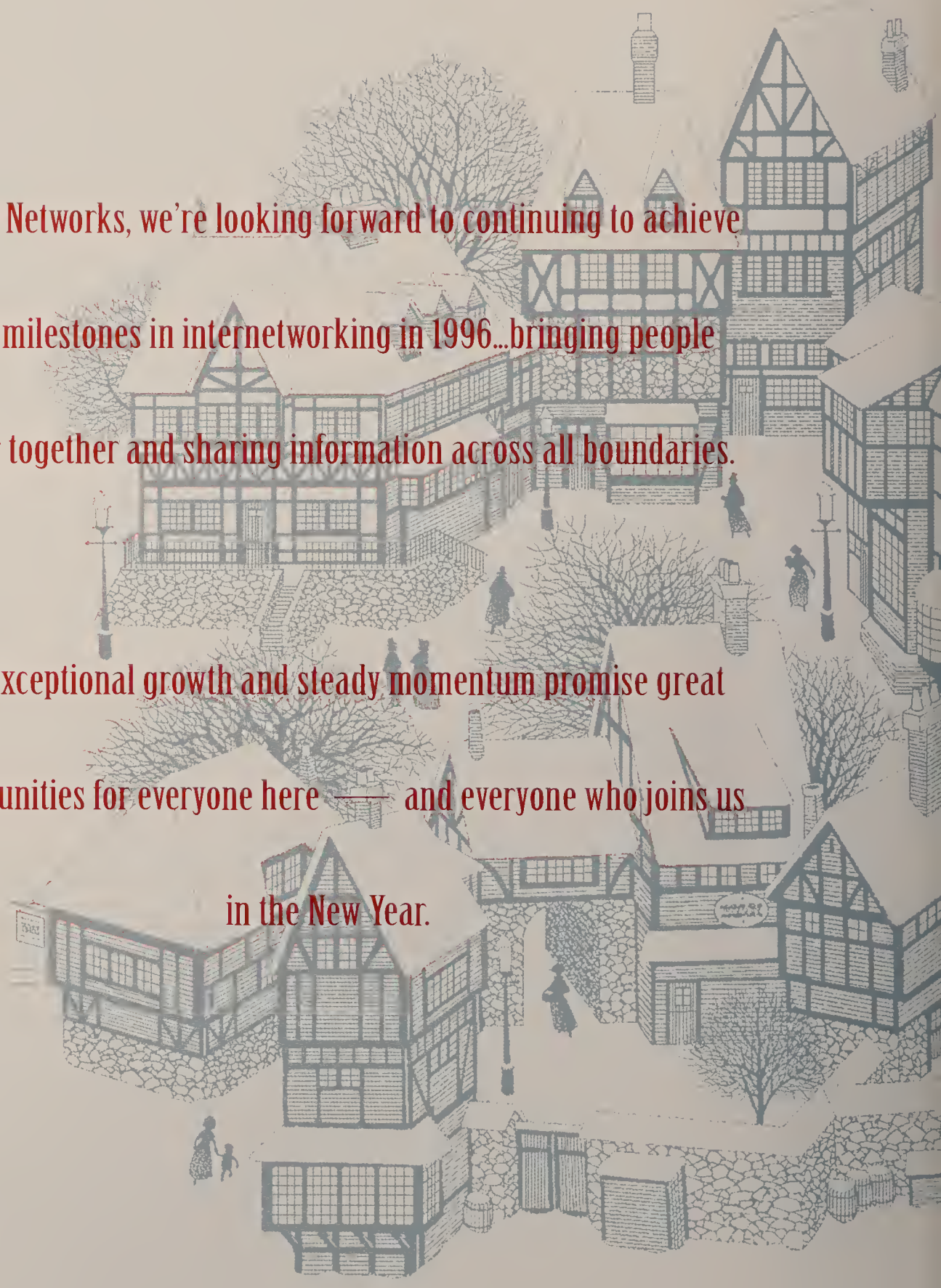
to all of you

from all of us...

Bay Networks

At Bay Networks, we're looking forward to continuing to achieve new milestones in internetworking in 1996...bringing people closer together and sharing information across all boundaries.

Our exceptional growth and steady momentum promise great opportunities for everyone here — and everyone who joins us in the New Year.



BEST WISHES

FOR SUCCESS AND PROSPERITY IN 1996

from

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Ten companies to watch in 1996

Opportunities abound in everything from ATM and wireless to video and the Web. Who will stand and deliver?

Ameritech looks good, even in the mud of the telecom wars

PROFILE

COMPANY: Ameritech
BASED: Chicago
FOUNDED: 1984
1994 REVENUE: $12.5 billion
PRIMARY PRODUCTS AND SERVICES: Local telephony, private lines, frame relay, SMDS, wide-area ATM, access to long-distance carriers

fun fact

Not many CEOs would want to find themselves standing next to the U.S. attorney general at a press conference. But Ameritech Chairman Richard Notebaert was delighted to stand aside Janet Reno and her chief antitrust deputy last April at the announcement of the Justice Department's agreement to let Ameritech pioneer the RBOC long-distance push.

Another year has passed with Ameritech Corp. still wearing a pro-competitive white hat, yet it's still virtually the only choice for local phone calls in its five-state region.

If this keeps up much longer, Ameritech Chairman and Chief Executive Officer Richard Notebaert will deserve an Academy Award or the industry will know that local telephone competition just isn't achievable in our time.

Ameritech's challenge in 1996 partly depends on which of two excruciatingly slow-to-develop telecommunications reform milestones is reached first: Judge Harold Greene's approval of the Department of Justice's Ameritech deregulation plan or the congressional passage of a telecommunications bill President Clinton can sign.

If in the race of two tortoises Judge Greene stumbles across the finish line, Ameritech will be limited to providing long-distance service originating out of the Chicago and Grand Rapids, Mich., metropolitan areas.

But if the herd of 535 U.S. representatives and senators manage to outcrawl Greene to the tape, Ameritech probably will be allowed to provide in-state long distance throughout its region within six months. It would also be allowed to roll out a national service, a project that would likely take about three years.

Because it has more than one path to the same goal, Ameritech appears better prepared than its sister regional Bell operating companies to hit the ground running. The carrier has formed a separate business unit, Ameritech Communications, Inc. (ACI), to conduct the long-distance effort and comply with likely restrictions on dealings with the carrier's local telephone operations.

ACI has hired a 160-person staff, reports Robert Rosenberg, president of Insight Research Corp., a consulting firm in Livingston, N.J. And Ameritech has been staffing up with marketing types from untraditional places, such as the entertainment industry, he says. As a result, the company likely will unleash an MCI Communications Corp.-style media campaign into its new markets.

But for Ameritech to provide long-distance service, it — like all the other RBOCs — will have to buy wholesale capacity from AT&T or other carriers with national networks and provide long-distance service on resale.

That results in a wicked irony. Originally, AT&T supported the Justice Department agreement, hoping to turn the tables and buy Ameritech service at wholesale and go into the local business through resale. But the Justice Department's resale regulations on Ameritech so far have proven less hardy than the resale rules the Federal Communications Commission imposes on AT&T.

The FCC repeatedly has forced AT&T to publicize deals with its biggest customers and allow others making huge net buys — including resellers looking to make a buck — to grab the same low rates and mark them up at retail.

Meanwhile, AT&T's negotiations for a wholesale local deal with Ameritech have fallen through, causing AT&T Chairman and CEO Robert Allen to come close to repudiating the Justice Department deal as too weak to provide reasonable rates.

Shrugging off Allen's criticism, Notebaert moved at the end of 1995 to show up AT&T as an isolated complainer.

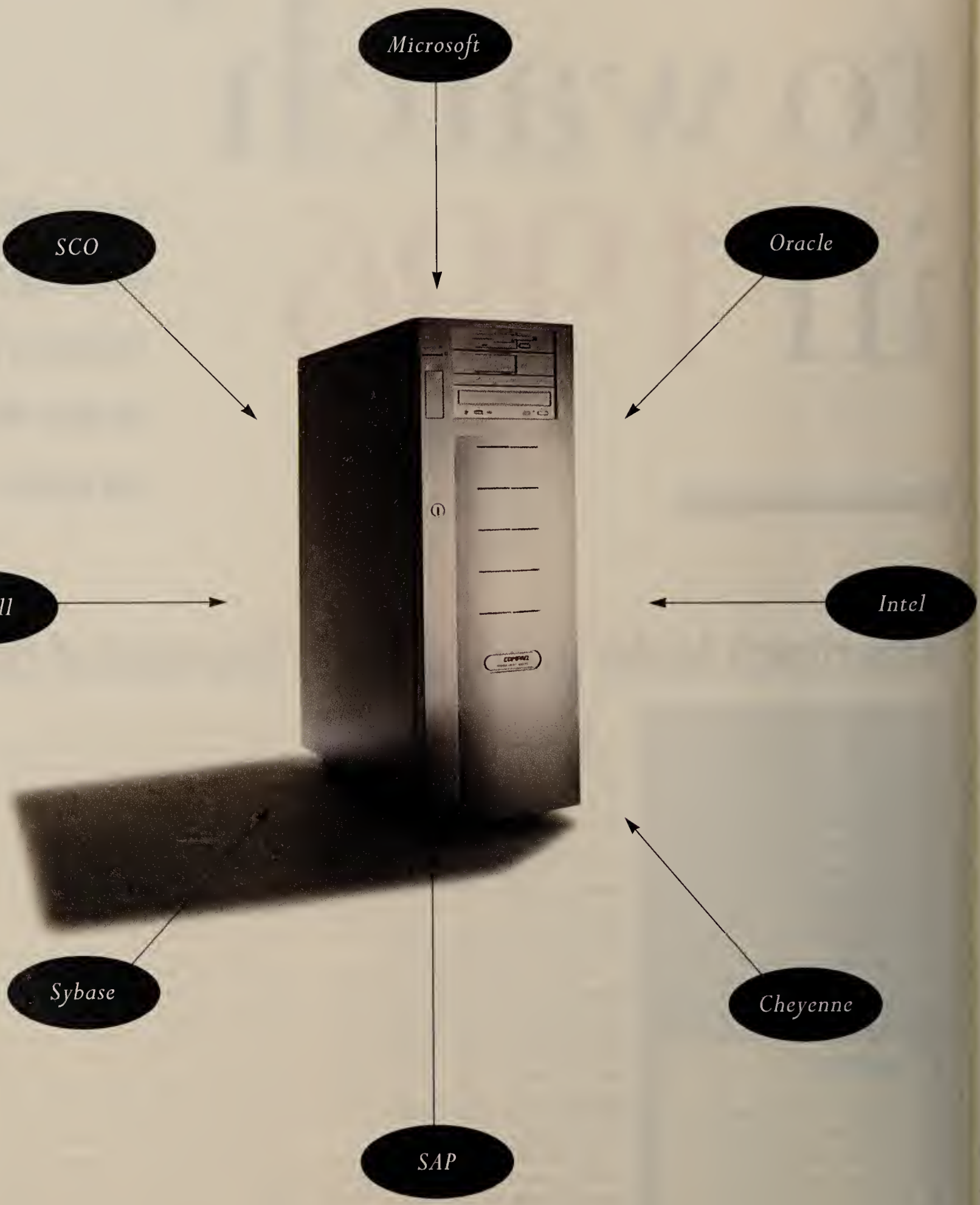
In early November, Ameritech succeeded in hammering out a resale agreement with little-known U.S. Network Corp. Then, at the end of November, Ameritech gained some credibility by announcing it had reached an agreement with MFS Communications Company, Inc. under which the fast-growing competitive access provider will resell Ameritech services and features.

Sounds like Ameritech will enter the 1996 telecommunications wars with that white hat firmly in place, whether or not AT&T tries to knock it off.

By David Rohde

SERVERS *are* BUILT *by* TEAMS *of* PEOPLE

SOLU



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COMPAQ

Has It Changed Your Life Yet?

Cisco enjoys healthy route

Cisco Systems, Inc. is known more for setting industry trends than for bucking them.

Indeed, Cisco introduced the world to routing and LAN internetworking when it was founded in 1984. A short time later, routing become the predominant method for interconnecting distributed LAN segments, and Cisco became the dominant supplier of routers, achieving a 75% share of the worldwide market.

Now users are rebuilding their routed networks with higher performance switching engines. As this trend continues, industry pundits say router sales will remain flat or steadily decline.

Come again? Though Cisco is acquiring product lines to gird for the industry shift to switched internetworking, the company continues to scoff at "Death of the Router" predictions. In fact, it continues to show healthy quarter-to-quarter growth in its core product line. Analysts say this pattern will continue into 1996.

This goes against the widely shared belief that sales of switches are killing router shipments.

"We expect that our router business will indeed continue to grow," says Ed Kozel, Cisco vice president of business development and chief technology officer. "The takeup of switching products will be very, very large over the next couple of years. But the necessity for routing technology will certainly remain. That is a technical certainty."

According to investment firm Robertson, Stephens & Co., $600 million of Cisco's $710 million in revenue for the first quarter of fiscal 1996 was from router sales. Router sales were up 9% from the fourth-quarter 1995 tally of $551 million, which was up 22% from the third-quarter 1995 figure of $452 million, the firm states.

As vice president of business development, it is incumbent upon Kozel to keep the router business growing while he sizes up companies to invest in, partner with or acquire to equip Cisco for the switching revolution. This situation must make the "Death of the Router" pundits feel he's working at cross purposes.

But Kozel is also acting vice president and general manager of Cisco's new Internet Business Unit. And it is the growth of the Internet, as well as carrier service provision, that's fueling continued demand for Cisco routers, he notes.

"You need routing functionality anytime you have a large or complex network," Kozel says. "Some of the largest and most complex networks that will arise in the future will be associated with the Internet as it pushes into the mass market or consumer space. Some of the networks that are being built for deployment to the consumer space by either the RBOCs or cable providers will represent large market opportunities for revenue."

And customers say they'll buy more routers to serve as the brains behind their switched infrastructures.

"We'll let the routers route between virtual LANs that the Catalyst 5000 [switches] create," says Allen Robel, senior network analyst for the computer services department at Indiana University in Bloomington. "The role of routers in the future is going to be more route calculation, not so much packet handling."

Indiana University will buy Cisco's new 7500 series routers to serve as route calculators. The acquisition might, however, be the school's last router purchase, Robel says.

So in addition to growing the router business, other items on Cisco's agenda for 1996 include:

■ Working toward gaining a 50% or greater share of the markets addressed by its six business units: ATM, Access, Core (routing), Workgroup, Internet and IBM Interworks.

■ Reaching $5 billion in annual revenue within three years.

■ Delivering the LightStream 1010 and 2080 ATM switches; a souped-up 7500 router for linking virtual subnets; ATM-Director and TrafficDirector management applications; route processing and other VLAN enhancements — including token-ring switching — for the Catalyst 5000; APPN High-Performance Routing software; and a remote access server to give Ascend Communications, Inc.'s MAX platform a run for its money.

■ Extending its offerings for wiring closets and low-cost switching applications.

■ Continuing to build alliances, including acquiring companies, to attack the telephone company/carrier, Internet and Japanese markets.

None of these areas, however, are considered holes in Cisco's current product and service offerings, Kozel says.

"I am not trying to fill gaps," he adds. "I'm trying to create new business opportunities."

By Jim Duffy

PROFILE

COMPANY: Cisco

BASED: San Jose, Calif.

FOUNDED: 1984

1995 FISCAL YEAR REVENUE: $2 billion

PRIMARY PRODUCTS: Routers and LAN switches

Vice President *Ed Kozel*

fun fact

Cisco has continued to grow its core router business, despite the industry trend toward switched internetworking.

RISING REVENUE

FY 1996 FY 1997

Robertson, Stephens & Co. estimates Cisco's revenue will jump to $3.4 billion in fiscal year 1996 and $4.9 billion in the next fiscal year.

Lotus fights for position in '96

Earlier in 1995, critics called Lotus Development Corp. a company in tatters. Its application business was cracking, and nearly every analyst in town claimed Lotus could not survive on its own.

Whether Lotus could have made it alone will never be known, since IBM swooped in and snatched the company for some $3.5 billion.

The always-active Lotus has long been a company to watch, but that is all the more true today with its new owners.

You see, IBM did not shell out that kind of dough for business as usual. Instead, the hardware giant hopes to closely intertwine Notes with a range of IBM enterprise tools. The result, both camps pray, is a product line that lets users across the enterprise share information so effectively that Notes becomes the default interface for network computing.

That is the $3.5 billion dream. The reality could be quite different, and that is what makes the IBM/Lotus union so interesting.

Here are the biggest challenges:

■ Maintaining Lotus' corporate culture, and hence, employee motivation. However, with nearly all the top Lotus executives already gone, IBM's promise of Lotus independence sounds a bit shallow. (Lotus CEO Jim Manzi and Bob Weiler, senior vice president of marketing, resigned. John Landry, chief technology officer, has become a consultant.) This issue is critical since observers cannot point to one highly successful piece of IBM PC software.

■ Countering competition. Microsoft Corp. has already convinced a large number of Notes third parties to develop products for its Exchange messaging server, a system closely linked with the free Exchange mail client found in Windows 95.

Novell, Inc. is gaining gobs of market share with its GroupWise messaging system, and it has not even come out with its ambitious revamp, GroupWise XTD.

Netscape Communications Corp., which bought Collabra Software, Inc. earlier this year (see story, page 24), could be a formidable competitor. Collabra has a terrific groupware user interface that it can more effectively mate to the Internet as a back-end. It doesn't hurt that Netscape is flush with initial public offering money either.

Even without new Collabra tools, the Web in general is a surprising threat to Notes. It is easier to set up collaborative applications on the Web than it is to establish a network of Notes servers, create applications, devise replication schemes, then manage the whole thing.

Lotus is well aware of the danger posed by the growth of the Internet. "The competitive framework has changed a lot," notes recently appointed Chief Operating Officer Jeffrey Papows. "The 'Net is of enormous consequence."

The company plans to address the threat by tightly meshing Notes with the Web, allowing Notes clients to browse the Web and Web browsers to access Notes, and by positioning Notes as a Web authoring and management system. "My goal is by mid-year that people will view Notes server as an essential part of any 'Net infrastructure," says Lotus CEO Michael Zisman.

PROFILE

COMPANY: Lotus

BASED: Cambridge, Mass.

FOUNDED: April 1982

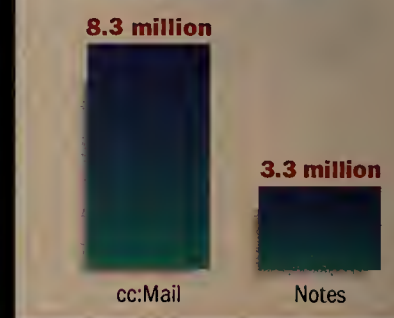
FINANCIALS: Due to the IBM acquisition, the first quarter of 1995 was the last in which Lotus posted separate revenue. The company lost $17.5 million on sales of $202 million then.

CEO *Mike Zisman*

fun fact

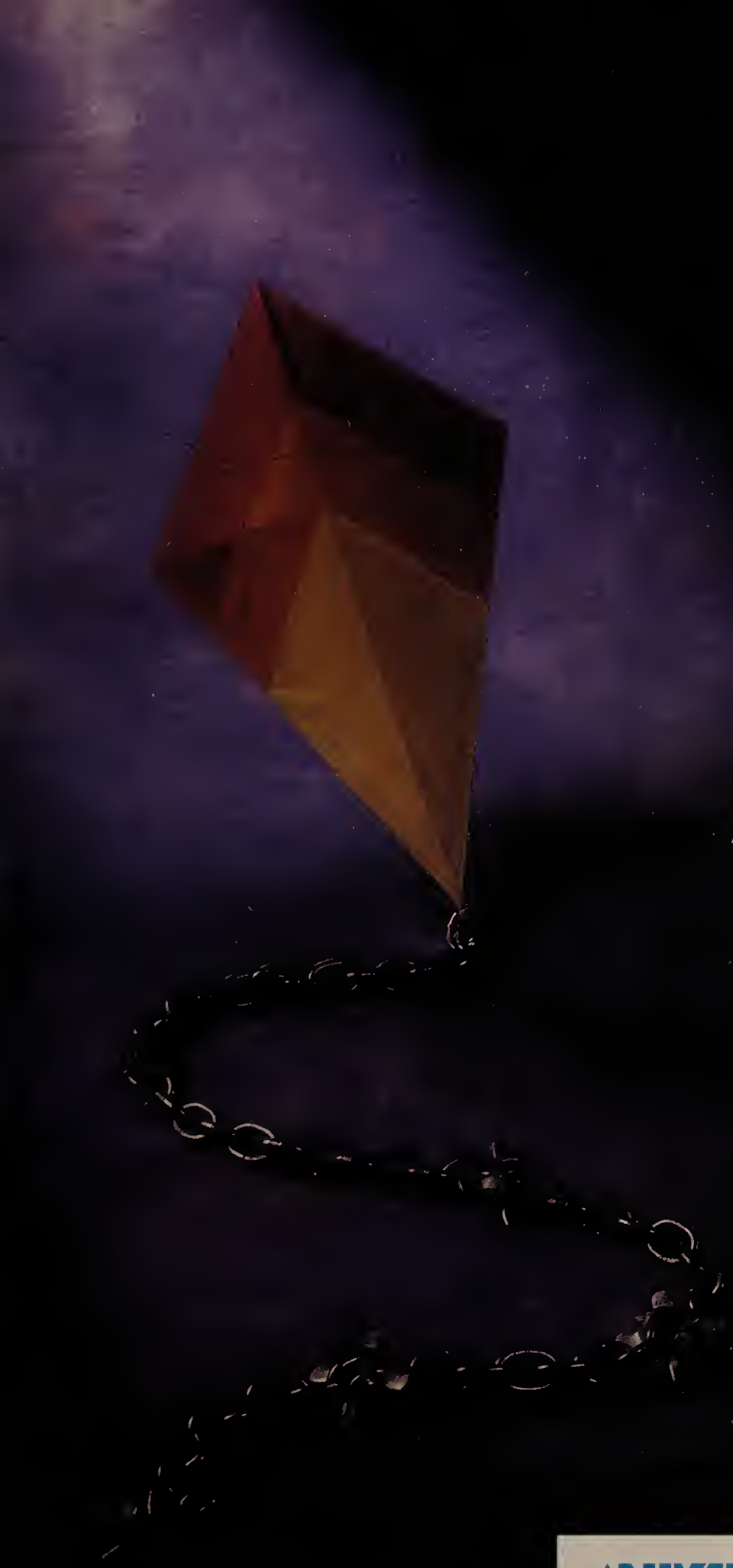
Lotus once discussed selling Notes to Microsoft, a deal that was obviously never consummated.

LOTUS COMMUNICATIONS BASE



Lotus also needs to repair the damage wrought by Microsoft in the suite market, which now outsells Lotus 8-to-1. Lotus hopes to regain some of its productivity luster by adding more network hooks, particularly to Notes. In fact, Zisman sees Notes as an alternate file system for tools such as SmartSuite.

By Doug Barney



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The 'Net is hot; so is Netscape

Just about any lunkhead knows about Netscape Communications Corp. by now, so long as they keep at least half an eye on the stock market.

Investors probably have all the details down pat: that Netscape's initial public offering in the heat of the summer was $28 per share and by early December, portfolios were burning as the stock price soared over $170.

The fact that the company lost $4.3 million during the first half of the year didn't seem to matter. The Internet was hot, and Netscape was one of the buzzwords. "They don't have earnings to speak of, but analysts say their products will be universally desired," says one stock market watcher who admits to computer illiteracy. "I just rue the day that I didn't buy it."

Well, the stock price did descend back to the planet Earth, and the potential investor was feeling better by midmonth. But curiosity about Netscape's future remains.

What'll be the big deal in 1996?

For starters, the merger with Collabra Software, Inc. promises some sparks in the groupware market. Eric Hahn, former president and chief executive officer of Collabra and now vice president of Netscape, said integration products between the two companies should start rolling out during the second half of the year.

The big three, he said, will feature:

- First and foremost, the combining of the Collabra client interface and the Netscape Navigator client interface into one.
- The melding of the Collabra Share server into the Netscape server product family.
- The switch from a proprietary protocol between the two to an open systems protocol. The Network News Transport Protocol and the Interactive Mail Access Protocol (IMAP) — which allows users to scan message headers and then download only selected messages — figure prominently in the company's thinking.

"When this combined product ships in 1996, you'll have access to a level of collaboration that you're not used to, like the ability to hold group discussions about anything you see on the Web — and not just chat or random newsgroup kinds of discussions, but real industrial strength collaboration like we do for corporate users," Hahn says.

Hahn adds that contrary to popular belief, 70% of Netscape's business is the corporate intranet market.

"A lot of people have a view of Netscape that we sell to individuals surfing the Internet," he says. "That's not true. It turns out that individuals don't usually have a lot of discretionary spending, and it's very expensive to sell to each individual anew. So corporate buyers are our bread and butter."

No pricing schemes have been set for any of the new products, but Hahn expects there will be a "family range of products."

By Carol Sliwa

PROFILE

COMPANY: Netscape
BASED: Mountain View, Calif.
FOUNDED: April 1994

Vice President *Eric Hahn*

1995 REVENUE: $37.43 million (first 9 months)

PRIMARY PRODUCTS: Netscape Navigator Web browser, Netscape Web servers, Collabra Share groupware

fun fact

Netscape's acquisition of Collabra became final on Nov. 9. On the day that Collabra employees completed their move into Netscape's offices, the town of Mountain View experienced a loss of electricity. A bad omen? Quite the contrary, said one Netscape employee, who suggested the new powerhouse company simply "blew them all away."

Sahara to put heat on ATM product vendors via low prices

Look to Sahara Networks, Inc. in 1996 to set dramatically lower prices for Asynchronous Transfer Mode wide-area access devices.

Its founders — once the core of General DataComm, Inc.'s ATM division — set up the company last June with the intent of catching a wave of ATM WAN demand they expect in 1997.

Their vision: less expensive ATM access boxes between the LAN and WAN that cater to specific applications, such as distributed databases across ATM virtual private networks (VPN) and broadband Internet access.

Sahara will market its technology to carriers, which will deploy Sahara equipment on user premises to tie into carrier ATM nets and the services those carriers will offer, such as ATM VPNs.

Sahara CEO Jonathan Reeves expects those offerings to blossom as deregulation lets carriers compete beyond their traditional boundaries.

Sahara plans to have its first ATM muxes ready toward the end of 1996. According to Reeves, ATM multiplexer pricing is standing in the way of the market opening up, with a typical access device costing $35,000 to provision and install in a network. Sahara expects to market equivalent devices at $15,000.

The secret: Sahara is developing a cell processing engine that "will give a greater integration of applications and performance improvements over earlier generations of access products," Reeves says.

He expects growing demand for Internet access, and Sahara products will be designed for that. "The carrier would drop an OC-3 to a building and run [an ATM VPN] off it," he says.

By Tim Greene

PROFILE

COMPANY: Sahara
FOUNDED: June 1995
PRODUCT LINE: ATM WAN access devices
FINANCING: Venture capital from Bessemer Venture Partners in Wellesley, Mass.

CEO *Jonathan Reeves*

fun fact

CEO Jonathan Reeves came up with the name for the company when he was stuck in traffic — near a Jeep Sahara.

Turning Platinum into gold

The new year should be harvest time for Platinum Technology, Inc., a company that has acquired about 20 smaller firms in the past couple of years.

The database and client/server management firm expects to start reaping the benefits of those purchases as it unites its acquired technology under a common management framework dubbed the Platinum Open Enterprise Management System (POEMS), says Andrew "Flip" Filipowski, the firm's president and chief executive officer.

POEMS will consist of a management console, a central object repository, a messaging layer, an event manager and a problem resolution module, most of which will be available by fall. Platinum's point products and suites for application development, database administration, data warehousing and systems management will hook into POEMS, as well.

Platinum's strategy of buying up best-of-breed products through acquisitions of firms like Trinzic Corp. and Answer Systems, Inc., and knitting the technology into the POEMS framework "may work or may not," says John Mann, research director at The Yankee Group, a market research firm in Boston. "The danger is that Platinum could get picked apart by a more focused data warehouse company," he says.

But observers say Platinum is in good hands with Filipowski — a colorful character who often dons all black — overseeing the integration of the company's many acquisitions. Before all the purchases, Platinum focused mainly on tools for managing IBM databases.

"Flip is a General Patton kind of guy; he seriously wants to win," Mann says. "The guy would be rock climbing without ropes if he weren't in this business."

Users are optimistic about Platinum's POEMS approach, figuring it will enable them to buy parts of the framework without committing to the entire platform.

"Platinum isn't looking to lock people in," says Peter Koski, vice president and manager of the distributed systems group at Goldman, Sachs & Co., an investment bank in New York that uses several Platinum tools. "They don't force you to buy the entire solution."

By Barb Cole

PROFILE

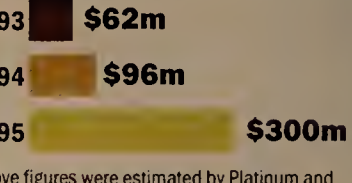
COMPANY: Platinum
BASED: Oakbrook Terrace, Ill.
FOUNDED: 1987
1995 REVENUE: $300 million
PRIMARY PRODUCTS: A suite of tools for handling critical management functions of both mainframe and client/server systems, plus application development tools, a repository and messaging-based middleware.

CEO *Andrew Filipowski*

fun fact

The company's headquarters is made of recycled components. In fact, its floors are made of old Coke bottles.

SKYROCKETING REVENUE



Above figures were estimated by Platinum and Robertson, Stephens & Co. of San Francisco.

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Spider weaves a new web

For the founders of start-up Spider Technologies, Inc., creating an application builder to link databases to the World-Wide Web was as simple as child's play.

"We saw the business opportunity when we were talking at places like the Hebrew day school where our kids go," says Zack Rinat, Spider Technologies' president and chief executive officer and former director of operations at Silicon Graphics, Inc. "We got to know each other trying to organize a school computer fair. It really grew out of contacts in a social setting."

Along with fellow Israeli-born computer scientists Doron Sherman (Spider's chief scientist) and Ofer Ben-Schachar (vice president of engineering), Rinat founded Spider Technologies in May with $1.9 million in funding from Hummer Winblad Venture Partners.

By October, the company had released its first product, dubbed Spider, an engine that communicates between any Web browser and a corporation's back-end database.

Spider's early adopters claim the product eliminates the need to write the usual common gateway scripts.

"You can create a full-featured application in half the time it would ordinarily take," says Paul Shutt, president of The Collective, a Midland, Mich., Web design company that is using Spider.

By Ellen Messmer

PROFILE

COMPANY: Spider Technologies

BASED: Palo Alto, Calif.

FOUNDED: May 1995

PRIMARY PRODUCT: Spider, a Web/database application builder

President *Zack Rinat*

fun fact

The Investors Group in Winnipeg, Ontario, the Metropolitan Board of Realtors in Indianapolis and The Collective in Midland, Mich., are among Spider's first customers.

SPIDER'S MARKET OPPORTUNITY

About one-fifth of 200 companies surveyed have bought into Web technology without doing any cost-justification analysis, according to The Yankee Group, a Boston-based consultancy.

PROFILE

COMPANY: SunSoft

FOUNDED: 1991 (became SunSoft in 1994; previously known as Sun Technology Enterprises)

President *Janpieter Scheerder*

1994 REVENUE: $5.9 billion for parent company Sun Microsystems (SunSoft numbers are not broken out.)

PRIMARY PRODUCTS: Solaris operating system, Solstice net management system, NEO object development tool, Java Internet development tool

fun fact

Sun stands for Stanford University Network.

SunSoft plans to shine in '96

SunSoft, Inc. is a company on the move. Supported by a new and powerful set of hardware tools from its parent — Sun Microsystems, Inc. — SunSoft intends to be more of a leader on the Internet, mostly through its new application language called Java and by adding features to its already comprehensive operating system, Solaris.

Those products are buttressed by others such as WorkShop, a product suite for application developers; Solstice, SunSoft's entry into the network operating system (NOS) space; and NEO, the firm's object technology.

Plans for 1996 include making the entire product line Java-enabled, melding SolarNet network management products with Solstice, delving into the security, software distribution and licensing arenas, and joining other major vendors such as Compaq Computer Corp. with expanded server management tools.

Expect more products for the World-Wide Web, as well.

SunSoft may offer a comprehensive operating system in Solaris, but the buzz around the Bay Area remains Java, Sun's Internet application language. The biggest question: How will the rest of the players in the software industry respond?

The buzz has been a boon to SunSoft, according to President Janpieter Scheerder, attracting new Solaris, Solstice and NEO customers.

SunSoft is offering the Java language free of charge to application builders and is pushing the JavaScript tool that simplifies the development process. SunSoft executives hope the language becomes the de facto Internet application language.

Java has the potential to change the way the Web browser is perceived. Now considered a dumb terminal similar to the early days of mainframes, a Java-enabled Web browser will be able to act as an application platform.

By Ben Heskett

Tivoli burns up mgmt. field

When you're hot, you're hot.

In the complex world of managing the changes, configurations, alerts and alarms of the burgeoning distributed client/sever world, few have done it with the verve and success of Tivoli Systems Inc.

Since 1992, when its first Tivoli Management Environment (TME) products shipped, the company has become a distributed systems management leader, alongside such heavyweights as IBM, Computer Associates International, Inc. and Hewlett-Packard Co.

TME is still the company's core product line and the biggest thing that differentiates Tivoli from its rivals. TME gives users a functional, object-oriented way of managing distributed client/server resources. Meanwhile, most other vendors are still doing slide shows on object-based management. TME includes tools and applications to manage distributed client/server environments.

Also key to the company's growing success is that it has allied with most of the heavy-hitters in the industry, with licensing agreements that include everyone from Intel Corp. and Microsoft Corp. to Remedy Corp. and Sun Microsystems, Inc. In contrast, many of its competitors continued to squabble among themselves.

"Our primary goal in 1996 is to enable the swift implementation of users' client/server applications from the lab to production," says Frank Moss, Tivoli chief executive officer and president. "We expect client/server applications to become truly mainstream in 1996, and we'll have the management tools to make implementation easier."

The key tool will be the company's forthcoming Applications Management Specification (AMS). AMS is a standardized API based on the Desktop Management Task Force's Desktop Management Interface (DMI). It will let users or third-party vendors write application management programs for use with Tivoli's TME platform or other DMI-compliant platforms. The specification will be available in early 1996.

"Specifically, we'll look at working with companies like SAP AG and PeopleSoft [Inc.], and other vendors of two- and three-tiered based client/server systems," Moss says. Tivoli will have a SAP application management product by the end of 1996.

"Users are clamoring for application management tools, especially for the SAP R/3 environment, so it will be important for Tivoli to lead here," adds Jill Huntington-Lee, senior analyst with Datapro Information Services group in Delran, N.J.

Moss says Tivoli's AMS-based applications will let users track resources and enterprise configurations, as well as monitor application performance.

Another warm spot for Tivoli will be providing management tools for the Windows, Windows 95 and Windows NT product lines. TME should now support those environments.

"The Windows environments are a real bell-ringer for us and an important new area for us to be part of," Moss says.

Last but certainly not least, Tivoli will announce its plans to provide management support of Internet applications in the first quarter of 1996, according to Moss.

"We are going to create a number of new alliances and come out with new products that will let users simultaneously manage client/server and Internet applications," he adds.

By Michael Cooney

PROFILE

COMPANY: Tivoli

BASED: Austin, Texas

FOUNDED: 1989

FINANCIALS: $33.5 million in revenue for first 9 months of 1995

President *Frank Moss*

PRIMARY PRODUCTS: TME line, application management specification tools

fun fact

Tivoli was founded by ex-IBMers, and since the company first shipped TME in 1992, over 50 other vendors have licensed the product, including IBM, Intel, HP and SunSoft.

MARKET BOOM

A recent META Group survey shows that **27% of 52 companies** surveyed are evaluating Tivoli products for distributed systems management. About **25%** of them were looking at **HP OpenView**, and **23%** were looking at **IBM SystemView**. The market is worth about **$1.5 billion** and will grow at a **30%** clip for the next five years, META says.

since June, Xylan anticipates revenue of $25 million to $30 million for all of 1995, and is now preparing for an initial public offering by mid-1996.

By year-end 1996, OmniSwitch should be outfitted fully and like no other switch, according to Douglas Hill, Xylan's vice president of marketing. While other switches require separate routers to filter traffic between different VLANs, Xylan has integrated IP routing into the switch itself and will add IPX routing with Release 2.0 in early 1996. Hill says that an overall routing upgrade during the first half of 1996 will boost performance to levels that better match the speed of LAN and ATM switching.

"The way Xylan lets you put some hierarchy back into flat, switched networks by

PROFILE

COMPANY: Xylan

BASED: Calabassas, Calif.

FOUNDED: July 1993

YEARLY REVENUE: $25 million to $30 million for calendar year 1995

Marketing VP *Douglas Hill*

PRIMARY PRODUCTS: OmniSwitch LAN backbone switches and PizzaSwitch workgroup switches

fun fact

With an IPO pending and Wall Street suits stopping by to visit, engineers may no longer go barefoot at the office, as they once did.

PHENOMENAL GROWTH

Xylan had 15 employees at the start of 1995 and now has 200.

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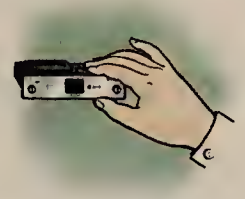

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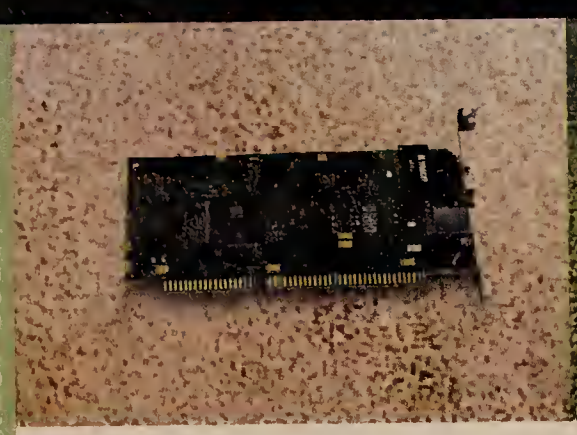

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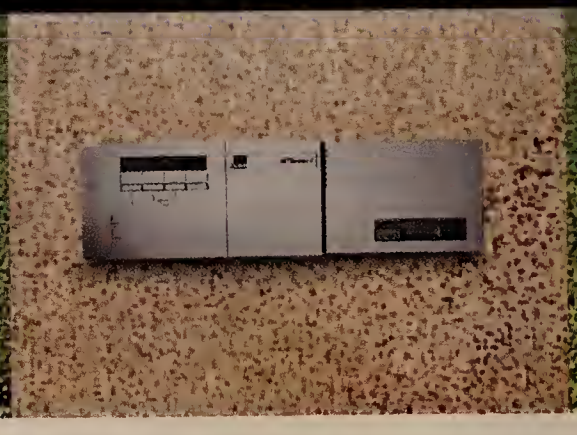

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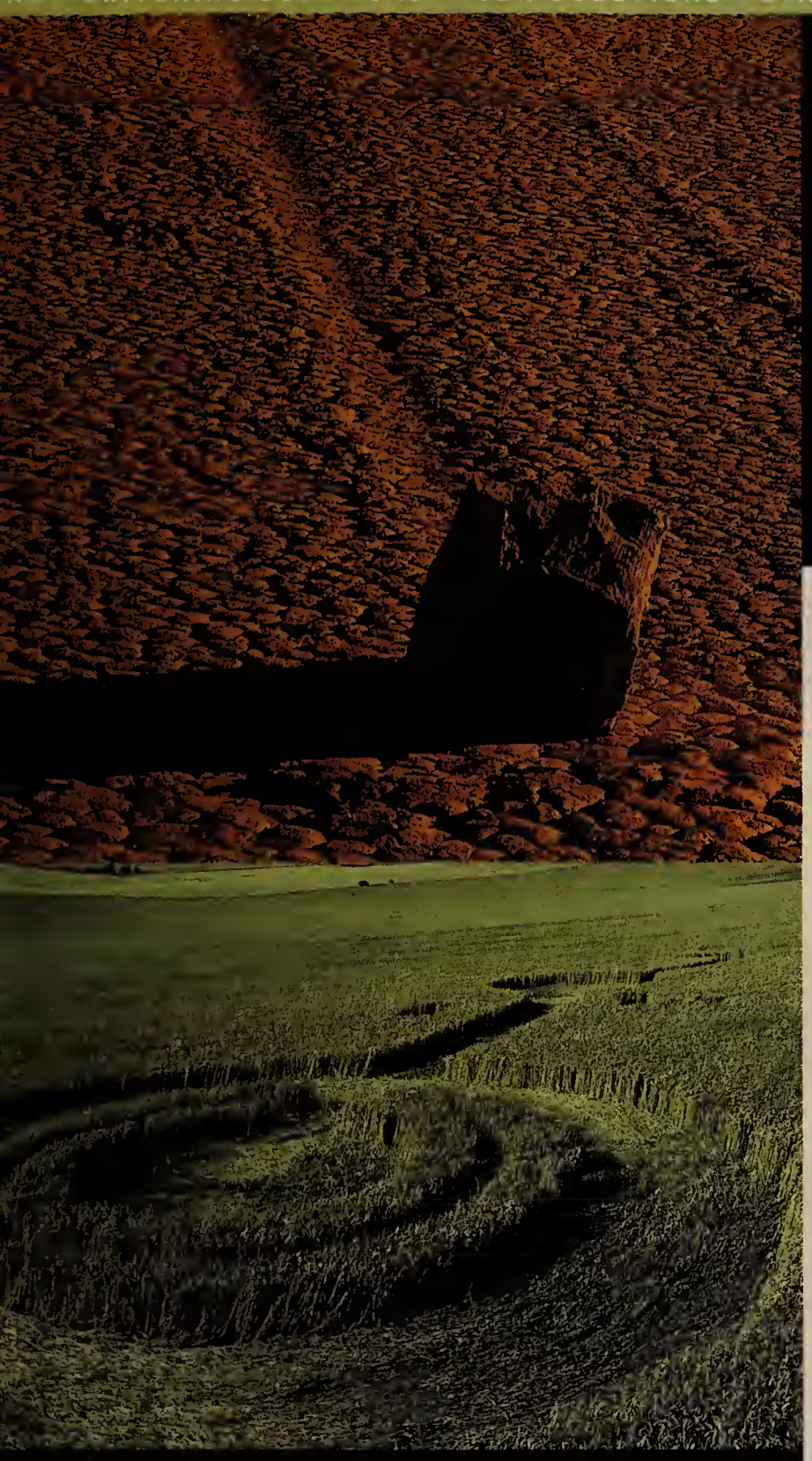

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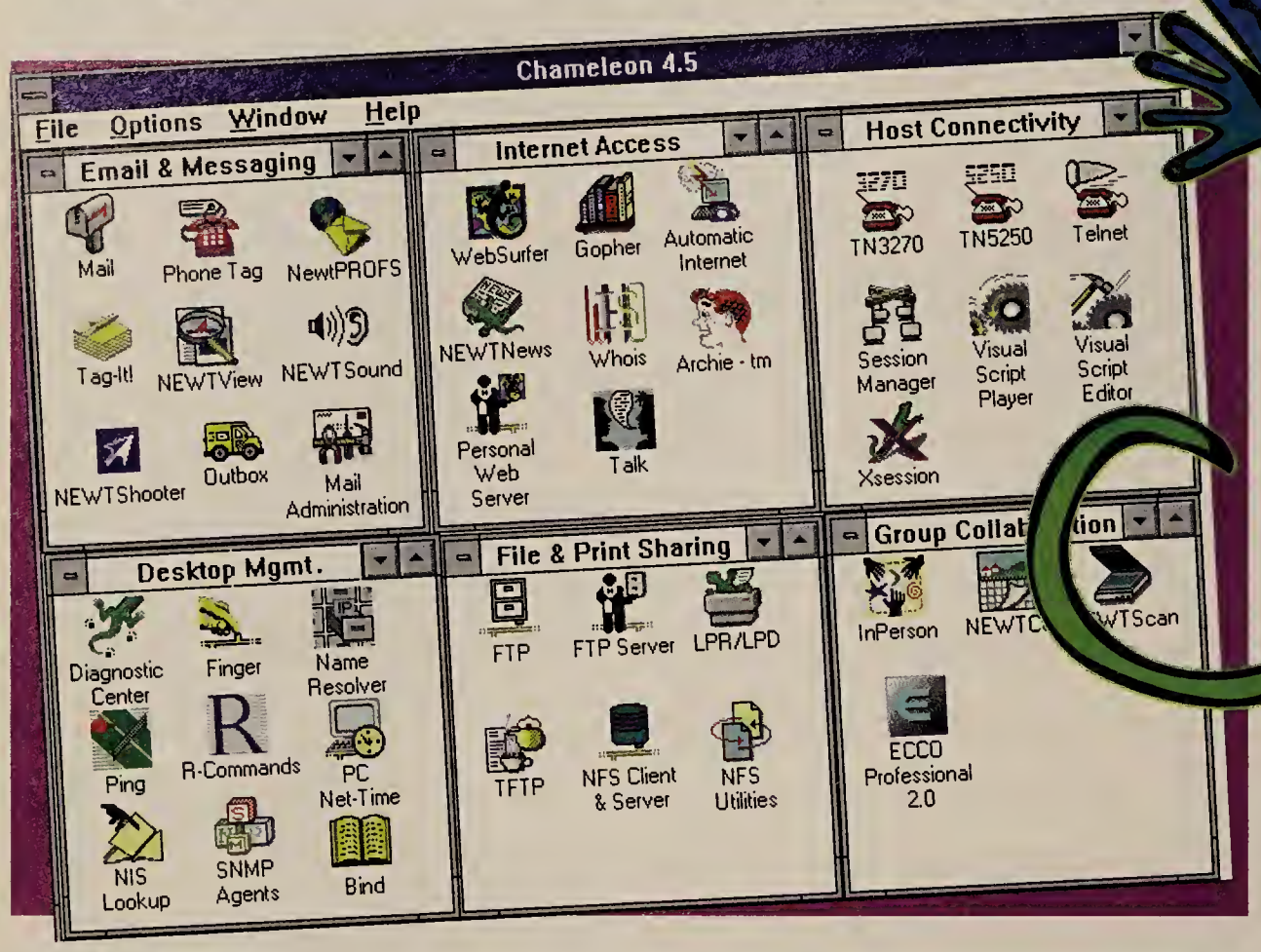

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The twenty-five most powerful people in networking

Your guide to the deal makers and breakers, technology wizards, cutting-edge users, pundits, rascals and the other muscle-flexing, mind-share grasping glitterati of the network industry.

Profiles by Paulina Borsook and Joanne Cummings. Caricatures by Gary Locke.

Power's an amorphous thing, tough to get your fingers around. It's difficult to define, like explaining Jell-O to an interplanetary visitor.

Just what makes someone powerful? As one industry insider demanded to know when asked to nominate candidates for this list: Do you view power as personal wealth derived from the network industry? The ability to influence network technology? Being a bleeding-edge user? Stock market valuation? Corporate revenue? Vision?

Well, yes and no. Yes, all those things can make someone powerful. And no, a single definition cannot hope to carry the day. (No different from the real world, folks, where Mother Teresa and Saddam Hussein hold power of vastly different stripes.)

Consider the members of the Power Class of 1995. The influence wielded by AT&T's Alex Mandl can't be measured by the same instruments as that of Sadie Decker, CIO of Tele-Communications, Inc. Or compare Eric Benhamou, CEO of 3Com Corp., with John Danielson, who oversees the Open User Recommended Solutions user group. Different personalities, different positions, different goals and ideals.

Yet each wields power. Each defines — in greater or lesser measure — the direction of the network industry and leaves a mark on technology or our thinking that is as unique as the snow angels they would make in fresh-fallen powder. Each has a different vision of networking's role in our world.

It's a subjective list, no doubt. Some argue, for example, that customers have no place on the roll, that industry kingpins like Bill Gates and Larry Ellison — the New Establishment types, in *Vanity Fair* parlance — hold all the cards.

But a ranking based on market-share muscle alone would make for dull reading indeed. More marketing for the marketing machines, as it were. It would ignore the other powerful and subtle influencers who make the network industry the world's most dynamic.

So herewith find our roster of outspoken customers, soothsayers, financiers, technologists, entrepreneurs, politicians, bigwigs and, yes, even a journalist.

You may not agree with what they're saying, but you can't ignore what they're doing.

Now that's power.

A KEY TO THE RATINGS

Power of the Purse
Money talks in this network business.

Power of Vision
Changing our thinking about networks.

Power of Market Presence
Where does an 800-lb. gorilla sleep?

Power over Technology
Steering the development of key technologies.

Power of Partners
Getting by with a little help from their friends.

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JIM ALLCHIN

Senior vice president, Business Systems Division, Microsoft Corp.

Microsoft is invading every facet of our lives: our desktops, our homes, the Internet, television. But Microsoft's Allchin has his feet squarely planted in just one place: the enterprise. Allchin oversees Microsoft's most important corporate computing assets: Windows NT, BackOffice and Exchange, Redmond's answer to Lotus Notes. His mission: Push the company beyond the desktop to rule the enterprise.

That Allchin is entrusted with such an important task comes as no surprise. "He's got a very good sense for what big companies need and knows how to put that into products," says James Kobielus, a product planner at Arlington, Va.-based LCC, L.L.C.

Kobielus says Windows NT is already "extremely successful, a very strong competitor to Unix." The BackOffice server bundle gives customers an easier way into client/server, and Exchange should give the firm secure footing in the groupware arena.

What more could an enterprise-centric software executive want?

CRAIG BENSON

Chairman/Chief operating officer, Cabletron Systems, Inc.

Benson sees switched virtual networking as a real-world cash cow.

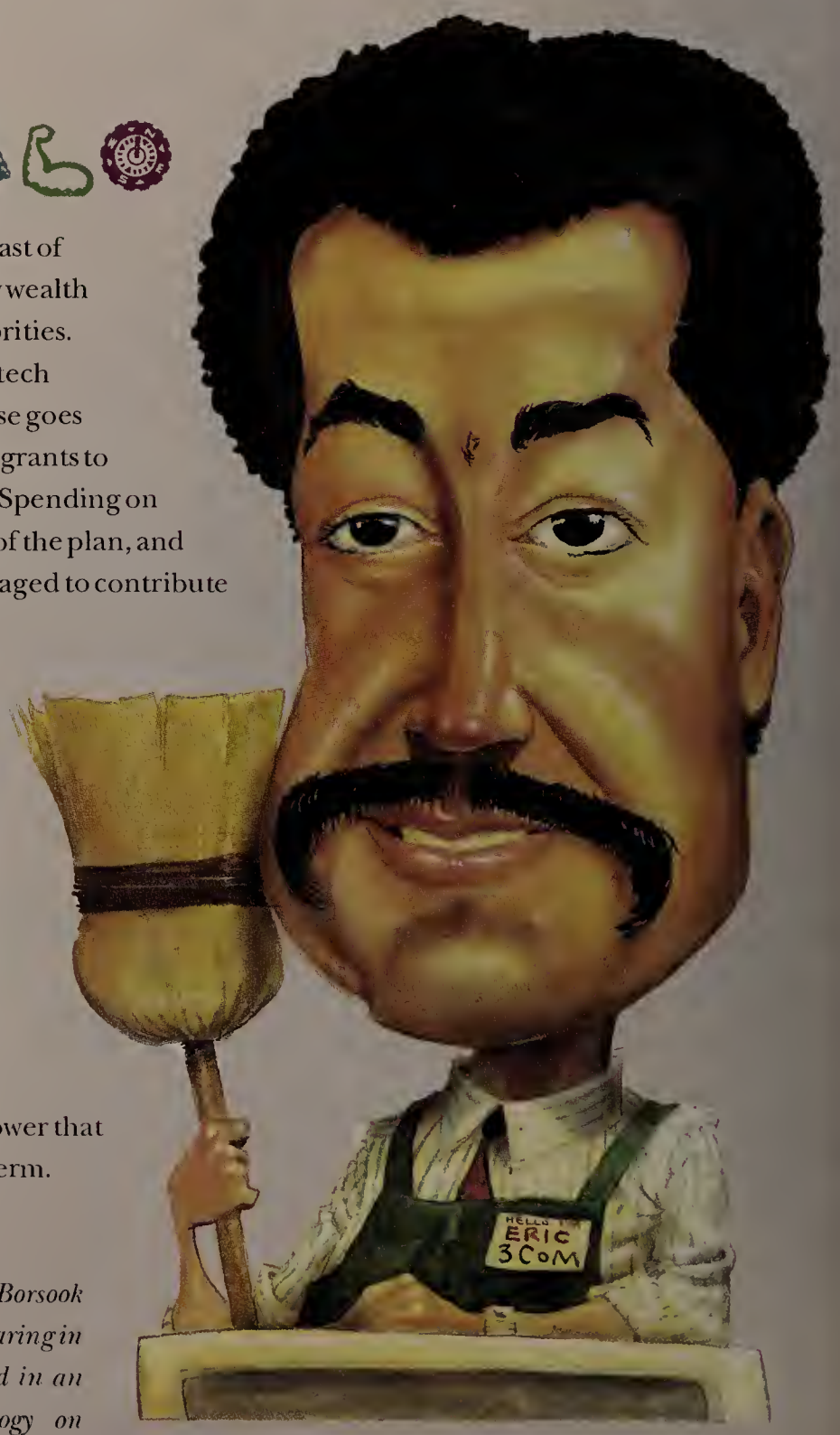
To that end, he's invested lots of internal resources to bolster the firm's switching products and its ability to manage virtual LANs. A top player in the management game thanks to its Spectrum platform, Cabletron is hoping to score big in VLAN management with its upcoming SecureFast Virtual Networking platform, due in the first half of 1996.

Benson also shored up Cabletron's low-end offerings by abandoning its go-it-alone philosophy and snatching up Standard Microsystems Corp.'s switching division, a move several analysts say was long overdue.

Only time will tell what the moves mean for the bottom line: Cabletron currently lags behind Cisco Systems, Inc., 3Com Corp. and Bay Networks, Inc. among network equipment suppliers. But fourth means an installed base of more than 80,000 customers and annual revenue of $934 million. And that makes Benson and Cabletron powers to be reckoned with in 1996.

3COM'S CHIEF IS A ONE-STOP SHOPKEEPER

Eric Benhamou has made 3Com a network shoppers' superstore.



You might say Eric Benhamou's power comes from being a contrarian.

Consider how 3Com Chairman and CEO Benhamou saved his networking company — now one of the industry's big three players — back in 1991 by jettisoning its operating system, 3+Open, and killing its relationship with Microsoft Corp. Benhamou concentrated 3Com's efforts on hardware at a time when all the world was saying hardware had become a commodity and software was where the value-add and profits were to be had.

Now Benhamou plans to make 3Com a force in the nascent consumer market. 3Com paid big to get its moniker on San Francisco's Candlestick Park, shocking Bay-area sports purists but ensuring name recognition among a new cadre of buyers.

By becoming a one-stop shopping force in net hardware, 3Com is expected to ring up around $2 billion in fiscal 1996 revenue. Its stock has rebounded from a 1991 per-share low of $1.38 to per-share prices above $52 in 1995.

Just as important, Benhamou has taken a leadership position in corporate philanthropy. 3Com commits 1% of its quarterly pretax operating profits to charity when the company's pretax margins are above 15%. The company invests in education, for example, in communities where its employees live and work.

Benhamou's attempt to "share our success," as he calls it, is a striking example of leadership in an industry where keeping abreast of technology and creating new wealth are considered the main priorities. Even more unusual for high-tech philanthropy, 3Com's largesse goes beyond the typical high-tech grants to bring technology to schools. Spending on the environment is also part of the plan, and 3Com employees are encouraged to contribute to Second Harvest, a program to feed the hungry.

Benhamou says he's hoping to build a culture of lasting value within 3Com. For a company that has had to absorb almost 10 acquisitions in four years and in an industry where the only constant is change, building that kind of culture gives Benhamou a form of power that really matters over the long term.

By Paulina Borsook

San Francisco-based writer Borsook (loris@well.com) has work appearing in Wired, Newsweek Japan *and in an upcoming Seal Press anthology on women in cyberspace.*

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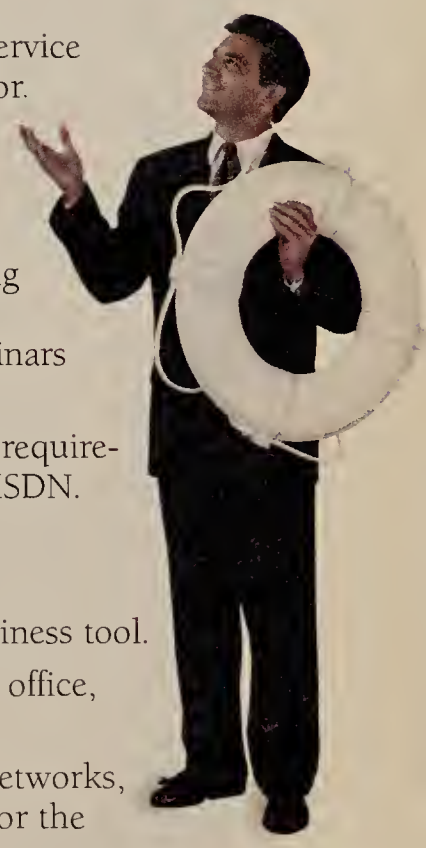

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CISCO SYSTEMS

THE NETWORK WORKS. NO EXCUSES.™

JOHN CHAMBERS

President/Chief executive officer, Cisco Systems, Inc.

Chambers has had a busy year since taking the top slot at Cisco. The acquisitive company has been busily working to extend its commanding lead in the routing market to the switching arena, where some savvy deals have positioned it nicely for the changes ahead in networking.

As if all the merger paperwork and integration chores aren't enough, Chambers plans to outdo IBM in SNA networking, where Cisco has quickly become a formidable challenger. It won't be easy to unseat Big Blue — the dominant infrastructure supplier — but Cisco is a juggernaut that's tough to stop.

That's not all that's on Chambers' plate for the coming year. He says Cisco will acquire as many as eight companies in 1996, including small Internet services firms and carrier services companies. That will make for an interesting mix of presents under the networking tree. But if anyone can make all this stuff work together, Chambers can.

JIM CLARK

Chairman, Netscape Communications Corp.

In less than two years, Clark has turned Netscape into the dominant player in Internet software and has become the high-tech industry's latest billionaire, thanks to Netscape's explosive stock launch. It wasn't just luck.

The former Stanford University professor has a knack for seeing into the future. His 1974 doctorate thesis at the University of Utah focused on virtual reality. In 1982, he founded Silicon Graphics, Inc. with the goal of developing powerful, three-dimensional graphics computer systems. Today, SGI has annual revenues of $1.5 billion.

Now Netscape, which he launched in early 1994 with the programming team that developed the Mosaic graphical user interface, is bringing the power of the Internet to virtually anyone. For just $39 per desktop and $3,000 per server, anyone can have a cross-platform, client/server collaborative computing environment — and that's shaking up the established software powerhouses such as Microsoft Corp. and IBM/Lotus Development Corp. With the acquisition of Collabra Software, Inc., a top groupware company, Netscape's influence over the Internet is poised to grow.

Analysts say Netscape is already the most important player in the next age of distributed network computing. "Netscape is to browsers what Microsoft is to client operating systems and Novell is to server operating systems," says James Kobielus, a product planner at Arlington, Va.-based LCC, L.L.C. Not a bad spot to be in.

SCOTT COOK

Chairman, Intuit, Inc.

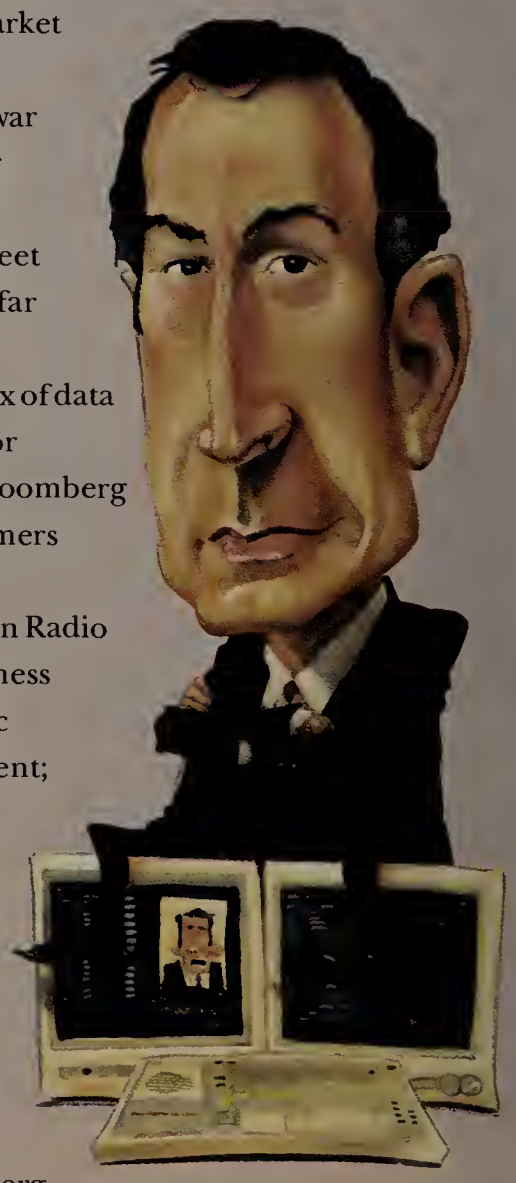
Cook has a way of cashing in on big opportunities. His firm, Intuit, was the first to recognize the need for easy-to-use personal finance software. With products such as Quicken and TurboTax, Intuit now owns the personal finance market.

Now Cook has his sights set on the Internet and on-line financial services, and he's lined up a cadre of powerful partners in the banking and credit card arena to help him make his vision a reality. Cook wants Quicken users to track stocks and securities in real time, pay bills and perform personal banking chores on-line. Given his installed base and the power of the brand name, Cook really can shake up the established financial players.

"They have a lot of potential," says Curt Monash, editor and publisher of the "Monash Software Letter" in New York. "They have an opportunity to become a leader in consumer applications for the World-Wide Web and other intercompany wide-area networking. Very few outfits are focusing on consumers' practical needs. Intuit is, and it should be congratulated."

KEEPING WALL ST. TRADERS ON TOP OF EVERYTHING

Bloomberg used the best of net technology to create new opportunities.



Michael Bloomberg has resolved the eternal information services market dilemma: Which takes priority, technology or content?

"You need to stay ahead in technology, but you win the long-term war over content," says Bloomberg, chief executive officer of Bloomberg Financial Markets. And he has proved it. More than a decade ago, Bloomberg put a bold new spin on delivering information to Wall Street traders, envisioning a market for that information which was to grow far wider than anyone else had imagined.

The Bloomberg news network offered financial types a real-time fix of data delivered using the highest end technology available at the time: color monitors, customizable software and intuitive interfaces. In short, Bloomberg leveraged state-of-the-art hardware and programming to offer customers better content.

He then went on to create a media empire: Bloomberg Information Radio and TV; *Bloomberg Magazine,* a business publication; Bloomberg Business News, a business news service syndicated in newspapers and on public television; *Bloomberg Personal,* a monthly Sunday newspaper supplement; and "Bloomberg Energy Newsletters." His company has grown to sales of around $600 million annually, employing a staff of 2,000.

Bloomberg stands behind his approach of using leading-edge — yet stealth — technology to deliver ever-improving content. "Technology gets accepted very quickly when users don't know they're getting it, and companies mask the fact that it's being introduced. Your thermostat may be more complex than it was 20 years ago, but you don't know or care."

That oft-overused phrase "synergy" plays a key role in the Bloomberg vision. While his radio and television programs are not profitable ("but will be down the road"), they serve as brand-makers and brand-markers in the information-thirsty upscale market.

Loss-leaders, so to speak, these content delivery vehicles are pointers to The Bloomberg financial information terminals, whose output has expanded to encompass sports, weather, news, listings of cultural events and just about anything else his target business consumers might be interested in.

By Paulina Borsook

WE COULDN'T DECIDE WHETHER TO TELL YOU ABOUT THE STACKABLE THAT OUTFUNCTIONS THE COMPETITION, OR THE ONE THAT UNDERPRICES THEM.

Decisions, decisions. Do we rave that the Digital MultiStack System has the most robust functionality in the industry? That it delivers local, remote and Internet access—not to mention wireless—so it's ideal for even the most widespread enterprises? Or should we talk dollars and cents: a starting price less than $50 per port, well below HP, 3COM and Bay Networks? Should we talk about Digital MultiStack's exceptional scalability? (It lets you add routers, switches, access servers, traffic analyzers, bridges and hubs as needed. Up to 16 hot-swappable hubs and 232 ports. So your network stays up and running, yet grows as your company does.) Or would you rather hear that our 10BaseT repeaters come with a lifetime warranty? Should we remind you that only Digital gear can be stacked or racked or chassis mounted or distributed between floors? And then managed effortlessly as a single domain with HUBwatch,™ Digital's low-cost management application? And what about an easy migration path to virtual networking? Only Digital MultiStack has one, thanks to enVISN: Digital's blueprint for the future of networks. Gee. With so many compelling reasons to pick a Digital MultiStack System, it seems there's only one choice after all. For more information contact your authorized Digital reseller or call us at 1-800-457-8211. Or e-mail to tbg@seetra.enet.dec.com.

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When we go to work, we work on
think about switching. When we ta
switching. When we eat dinner, we
about our future, we talk about sw
we go on and on about switching. Wher

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witching. When we eat breakfast, we
ke customers to lunch, we talk about
talk about switching. When we talk
tching. When we talk to our friends,
we go to bed, we dream about switching.

Should you
come to us for
switching?

Yes.

Should you
come to us for
a wild time on
Friday night?

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And our obsession has paid off. Our breakthrough ASIC technology has enabled us to develop products for virtually every switching need, whether backbone or workgroup; Ethernet or Token Ring; even FDDI, Fast Ethernet and ATM. The LinkSwitch™ 1000, with Fast Ethernet switching starting at $199* per port and the powerful LANplex® 2500, with throughput up to 565K packets per second (pps), are just two examples. And everything is covered by 3Com's® comprehensive Transcend® network management. The result? We're the worldwide market leader in backbone switching.

For help with all your switching needs, call **1-800-NET-3Com** and we'll send you the *Obsessed With Switching* kit which includes our *Pocket Guide to Switching*. For information on the hottest clubs in town, you're on your own.

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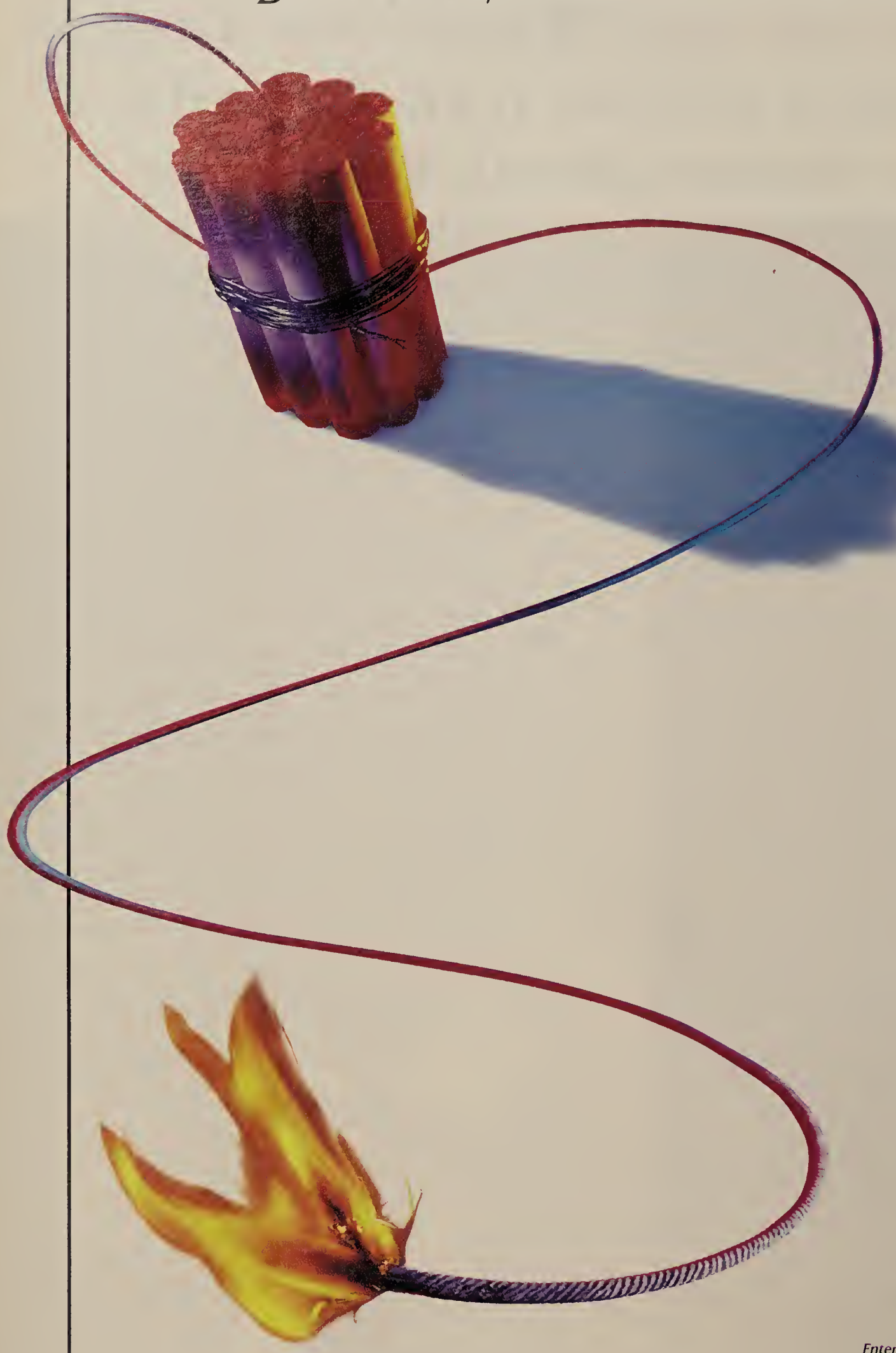
If you see the Internet as a potential gold mine, what does that make us?



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1 Industry: (check one only)

01. ☐ Manufacturers (other)
02. ☐ Finance/Banking
03. ☐ Insurance/Real Estate/Legal
04. ☐ Health Care Services
05. ☐ Hospitality/Entertainment/Recreation
06. ☐ Media/TV/Cable/Radio/Print
07. ☐ Retail/Wholesale Trade/Business Services
08. ☐ Transportation
09. ☐ Utilities
10. ☐ Education
11. ☐ Process Industries (Mining/Construction/ Petroleum Refining/Agriculture/Forestry)
12. ☐ Government (Federal/State/Local)
13. ☐ Military
14. ☐ Aerospace
15. ☐ Consultants (Independent)
16. ☐ Carriers/Interconnects
17. ☐ Manufacturers (Computer/Communications)
18. ☐ Resellers of Computer/Network Products (VARs, VADs, Distributors)
19. ☐ Systems/Network Integrators
20. ☐ Distributors (Computer/Communications)
21. ☐ Other *(please specify)*_____

2 What is your job function? (check one only)

NETWORK IS MANAGEMENT:

1. ☐ Networking Management
2. ☐ LAN Management
3. ☐ Datacom/Telecom Management
4. ☐ IS, IT, MIS, Systems Management
5. ☐ Engineering Management
6. ☐ Corporate Management (CIO, CEO, Pres., VP, Dir., Mgr., Financial Management)
7. ☐ Consultant (Independent)
8. ☐ Other *(please specify)*_____

3 What is the total number of sites for which you have purchase influence? (check one only)

1. ☐ 100+
2. ☐ 50 - 99
3. ☐ 20 - 49
4. ☐ 10 - 19
5. ☐ 2 - 9
6. ☐ 1
7. ☐ None

4 What is your scope and involvement in purchasing decisions for network products & services for your enterprise?

A. SCOPE (check one only)
1. ☐ Corporate/Enterprise
2. ☐ Department
3. ☐ None

B. INVOLVEMENT (check all that apply)
1. ☐ Recommend/Specify
2. ☐ Approve
3. ☐ Evaluate
4. ☐ Determine the need
5. ☐ None

5 Check ALL that apply in Columns A and B:

A. I am involved in the purchase of the following products/services:
B. I plan to purchase the following products/services:

A	B	
❑	❑	**100 LOCAL-AREA NETWORKS**
☐	☐	01. Local-Area Networks
☐	☐	02. Network Op. Sys. Software
☐	☐	03. LAN Storage/Backup
☐	☐	04. Optical LAN Storage/Backup
☐	☐	05. Disk LAN Storage/Backup
☐	☐	06. Tape LAN Storage/Backup
☐	☐	07. RAID LAN Storage/Backup
☐	☐	08. Network Test/Diagnostic Tools
☐	☐	09. Cables, Connectors, Baluns
☐	☐	10. UPS
☐	☐	11. Network Interface Cards
☐	☐	12. Peer-to-Peer LANs
☐	☐	13. SNMP Network Management
☐	☐	14. ATM Switches
☐	☐	15. Token-Ring Switches
☐	☐	16. Ethernet Switches
☐	☐	17. Remote LAN Access/Communications Servers
☐	☐	18. Superservers
☐	☐	19. File/Application Servers
☐	☐	20. Print Servers
❑	❑	**101 INTERNETWORKING**
☐	☐	21. Bridges
☐	☐	22. Routers
☐	☐	23. Bridge/Router
☐	☐	24. Gateways
☐	☐	25. Intelligent Hubs/Stackables
❑	❑	**102 COMPUTERS/PERIPHERALS**
☐	☐	26. Laptops/Notebooks/Sub-Notebooks
☐	☐	27. Micros/PCs
☐	☐	28. Minis
☐	☐	29. Mainframes
☐	☐	30. Workstations
☐	☐	31. Terminals
☐	☐	32. Printers
☐	☐	33. Cluster Controllers
☐	☐	34. Monitors
☐	☐	35. Fax/Modem Boards
❑	❑	**103 REMOTE/WIRELESS COMPUTING**
☐	☐	36. PDAs
☐	☐	37. PCMCIA Devices
☐	☐	38. Wireless Data Services
☐	☐	39. Wireless Data Equipment
☐	☐	40. Wireless LANs
☐	☐	41. Cellular Equipment & Services
❑	❑	**104 INTERNET/ELECTRONIC COMMERCE**
☐	☐	42. Internet Access Providers
☐	☐	43. Firewalls
☐	☐	44. Web Servers/Browsers
☐	☐	45. Internet Software Tools
❑	❑	**105 SOFTWARE/APPLICATIONS**
☐	☐	46. Network Management
☐	☐	47. Systems Management
☐	☐	48. Security
☐	☐	49. Communications Software
☐	☐	50. Terminal Emulation
☐	☐	51. Word Processing
☐	☐	52. Operating Systems
☐	☐	53. Client/Server Applications Development
☐	☐	54. Database Management/RDBMS
☐	☐	55. Spreadsheet
☐	☐	56. Groupware
☐	☐	57. EDI
☐	☐	58. E-mail
☐	☐	59. Windows/Graphical User Interface
☐	☐	60. Multimedia
☐	☐	61. Graphics/DTP
☐	☐	62. Remote Access
☐	☐	63. Imaging
☐	☐	64. Suites
☐	☐	65. Middleware
☐	☐	66. Document Management
☐	☐	67. Database Server
☐	☐	68. Site Metering Tools
☐	☐	69. Computer-Integrated Telephony (CIT)
❑	❑	**106 WIDE-AREA NETWORK EQUIPMENT & SERVICES**
☐	☐	70. Frame Relay Equip./Services
☐	☐	71. Modems
☐	☐	72. FT-1/T-1/T-3 Multiplexers
☐	☐	73. FT-1/T-1/T-3 Services
☐	☐	74. SONET
☐	☐	75. Inverse Multiplexers
☐	☐	76. SMDS
☐	☐	77. Asynchronous Transfer Mode
☐	☐	78. Diagnostic/Test Equipment
☐	☐	79. DSU/CSU
☐	☐	80. VSAT/Satellite
☐	☐	81. ISDN Equipment & Services
☐	☐	82. PBXs
☐	☐	83. Voice Mail/Response
☐	☐	84. Videoconferencing
☐	☐	85. Leased Lines
☐	☐	86. Switched Data
☐	☐	87. E-mail/On-line Services
☐	☐	88. 800/900/MTS Services
☐	☐	89. Virtual Networks
☐	☐	90. Outsourcing/Systems Integration Services
☐	☐	91. Education/Training Services
☐	☐	92. None of the above (1-91)

6 What is the total number of LANs, workstations/nodes at this location/ in your organization?

At this location: LANs		Workstations/ Nodes	Entire organization: LANs		Workstations/ Nodes
1.	☐ 5,000+	☐	1.	☐ 5,000+	☐
2.	☐ 1,000 - 4,999	☐	2.	☐ 1,000 - 4,999	☐
3.	☐ 100 - 999	☐	3.	☐ 100 - 999	☐
4.	☐ 50 - 99	☐	4.	☐ 50 - 99	☐
5.	☐ 10 - 49	☐	5.	☐ 10 - 49	☐
6.	☐ 1 - 9	☐	6.	☐ 1 - 9	☐

7 Check ALL that apply in Columns A and B:

A. The following network platforms are currently installed:
B. The following network platforms are planned for purchase:

A	B	
❑	❑	**55 NETWORK ARCHITECTURES**
☐	☐	01. SNA
☐	☐	02. DECnet
☐	☐	03. TCP/IP
☐	☐	04. Novell IPX/SPX
☐	☐	05. APPC/APPN/LU 6.2
☐	☐	06. NETBIOS
☐	☐	07. AppleTalk
☐	☐	08. NFS
☐	☐	09. Other *(please specify)*_____
❑	❑	**56 NETWORK OPERATING SYSTEM**
☐	☐	10. Microsoft (LAN Manager)
☐	☐	11. Novell (NetWare 2.X, 3.X)
☐	☐	12. Novell (NetWare 4.X)
☐	☐	13. Windows NT
☐	☐	14. Windows NT/Advanced Server
☐	☐	15. LocalTalk (AppleTalk)
☐	☐	16. Banyan (VINES)
☐	☐	17. IBM (LAN Server)
☐	☐	18. IBM (PC LAN Program)
☐	☐	19. Artisoft (LANtastic)
☐	☐	20. Digital (Pathworks)
☐	☐	21. Other *(please specify)*_____
❑	❑	**57 LAN ENVIRONMENT**
☐	☐	22. 4M Token Ring
☐	☐	23. 16M Token Ring
☐	☐	24. Ethernet
☐	☐	25. 100M Ethernet
☐	☐	26. StarLAN
☐	☐	27. FDDI
☐	☐	28. LocalTalk
☐	☐	29. 10Base-T
☐	☐	30. ATM
☐	☐	31. Other *(please specify)*_____
❑	❑	**58 COMPUTER OPERATING SYSTEM**
☐	☐	32. DOS
☐	☐	33. Unix/Xenix/AIX
☐	☐	34. OS/2
☐	☐	35. OS/2 Warp
☐	☐	36. IBM MVS
☐	☐	37. IBM VM
☐	☐	38. Digital VMS
☐	☐	39. Macintosh
☐	☐	40. Windows
☐	☐	41. Windows 95
☐	☐	42. X Window System
☐	☐	43. Solaris
☐	☐	44. Other *(please specify)*_____
☐	☐	45. None of the above (1-44)

8 For which areas outside of North America do you have purchase influence? (check all that apply)

1. ☐ Europe
2. ☐ Asia
3. ☐ South America
4. ☐ Australia
5. ☐ Middle East
6. ☐ None

9 Do you have or plan to install client/server networks? ☐ Yes ☐ No

10 Which of the following hardware platforms are installed/planned in your company? (check all that apply)

Mainframes	A – Installed	B – Planned
1. IBM	☐	☐
2. Amdahl	☐	☐
3. Cray	☐	☐
4. Hitachi	☐	☐
5. Unisys	☐	☐

Minis	C – Installed	D – Planned
1. IBM	☐	☐
2. Digital	☐	☐
3. Tandem	☐	☐
4. Unisys	☐	☐
5. AT&T GIS	☐	☐
6. HP	☐	☐
7. Data General	☐	☐

Which of the following do you have installed/planned: (USE NUMBERS ONLY)

	At this location: E – Servers	At this location: F – Clients/Nodes	Entire organization: G – Servers	Entire organization: H – Clients/Nodes
1. Power PC				
2. Power Macintosh				
3. Macintosh (Other)				
4. Pentium-based				
5. 80486-based				
6. 80386-based				
7. 80286-based				
8. RISC-based workstations				
9. Other				

11 What is the estimated value of networking equipment and services that you help specify, recommend or approve annually? (check one only)

01. ☐ $100 million or more
02. ☐ $50 million - $99.9 million
03. ☐ $25 million - $49.9 million
04. ☐ $20 million - $24.9 million
05. ☐ $10 million - $19.9 million
06. ☐ $5 million - $9.9 million
07. ☐ $1 million - $4.9 million
08. ☐ $500,000 - $999,999
09. ☐ $250,000 - $499,999
10. ☐ $249,999 or less
11. ☐ None of the above

12 Estimated gross annual revenue of your entire company/institution: (check one only)

1. ☐ $10 billion or more
2. ☐ $1 billion to $9.9 billion
3. ☐ $500 million to $999.9 million
4. ☐ $100 million to $499.9 million
5. ☐ $50 million to $99.9 million
6. ☐ $10 million to $49.9 million
7. ☐ $5 million to $9.9 million
8. ☐ $4.9 million or less
9. ☐ None of the above

13 Estimated number of employees at this location/in entire organization:

At this location:			
1.	☐ Over 10,000	4.	☐ 1,000 - 2,499
2.	☐ 5,000 - 9,999	5.	☐ 500 - 999
3.	☐ 2,500 - 4,999	6.	☐ 499 or less

Entire organization:			
1.	☐ Over 10,000	4.	☐ 1,000 - 2,499
2.	☐ 5,000 - 9,999	5.	☐ 500 - 999
3.	☐ 2,500 - 4,999	6.	☐ 499 or less

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ERIC COOPER

President/Chief executive officer, Fore Systems, Inc.

When you think of Asynchronous Transfer Mode, the company that comes to mind first is Fore. And Cooper is largely the reason for the firm's phenomenal success.

Launched in 1990, Fore quickly climbed to the top of the ATM heap and has been able to remain well ahead of even the most established vendors entering the ATM fray. And Cooper is intent on keeping it that way.

While hub and router makers face the formidable task of building or buying up ATM products, Cooper has the opposite challenge — gaining the traditional network technologies to shore up his ATM strength.

To that end, he made some savvy acquisitions this year, including Applied Network Technology, Inc., an Ethernet switching firm, and RainbowBridge Communications, the routing software firm that helped spark development of the ATM Forum's Private Network-to-Network Interface interswitch routing protocol. Late in December, Fore also announced plans to buy switchmaker Alantec Corp.

"Eric figured out a way to merchandise ATM well in advance of the commercial curve for adoption," says Thomas Nolle, president of CIMI Corp., a Voorhees, N.J., consultancy. "But what he has to do in '96 is reposition for the commercial market without losing all of the early adopters he's secured up until now."

CIO ON THE EDGE

TCI's Decker cracks the whip on a major upgrade.

Sadie Decker is a CIO in a paradoxical position.

SummitTrak, the high-profile reengineering effort she's overseeing at Tele-Communications, Inc. (TCI) — the company is reportedly spending more than $100 million on software alone — is not so much directed at internal users but at the new products and technologies the company has to offer in the future.

In short, Decker is charged with redefining the world inside Denver-based TCI to prepare the cable television powerhouse for a whole new world of opportunity and peril outside. "We try to stay focused on external things," she says, meaning the chaotic marketplace for consumer media such as on-line shopping and movies on demand.

SummitTrak will enable TCI to respond quickly and flexibly to present-day sales and service requests, and serve as infrastructure for the next generation of products.

The former chief information officer for the Lockheed Martin Astronautics Group says that over time, it may become more difficult for consumers to distinguish among offerings from cable companies, local and long-distance telephone companies, and Internet service providers. But Decker doesn't believe that any player in the race to provide digital information and entertainment services has a lock on the future.

"Do I see one unified answer? No. Who else can do news like CNN? Make movies like Spielberg? Sega isn't going to be Spielberg, and [software] tool makers aren't going to make movies," she says. "Everybody has one ace; nobody has four. Customers just want things to work."

By Paulina Borsook

SPARKING REAL CHANGE

Danielson leads a user group that works.

John Danielson has the quiet but dangerous-to-underestimate power of an ombudsman. The former professor of economics at Ottawa's Carleton University is chairman of Open User Recommended Solutions (OURS), a user group with a strong bias toward action. Counting among its small but powerful membership base some of the top CIOs in the U.S., OURS has created recommendations that major hardware and software vendors actually heed.

For example, the OURS Software Licensing Guidelines have been adopted by IBM, Digital Equipment Corp., Intel Corp. and Microsoft Corp. Danielson calls that a "good example of how vendors and users can come together. If vendors understand business problems, they can translate them into IT needs," he adds. "Having a pool of committed users offers a tremendous advantage for developers of hardware and software."

To Danielson, "the core value of OURS is the work of our task forces, where we focus on getting a product [that is, a recommendation] delivered within a year. OURS is a lot like the [Internet Engineering Task Force]." IETF, the volunteer group charged with defining new technologies for the Internet, has a reputation for being one the most effective and productive standards bodies in the world.

Danielson, who previously managed project financing at Kaiser Engineers, started OURS with Elaine Bond, CIO of The Chase Manhattan Bank N.A., in 1987. But he also has his work cut out for him as vice president of computer and telecommunications at Pacific Gas & Electric Co., where he oversees a $200 million annual IT budget. Much of that is going toward client server technologies that Danielson hopes will help the utility flourish in a newly deregulated market. He's trying to make the company as flexible and responsive as possible.

Danielson seeks to give OURS power beyond the strictly technical. For example, the group is defining what CIOs need to train their staffs for a distributed computing world. "What are the educational requirements as IT moves to client/server?" asks Danielson, who already knows that knowledge is power.

By Paulina Borsook

PAUL EDMUNDS

Senior information analyst, Duke Power Co.

Network management vendors need look no further than Edmunds and Charlotte, N.C.-based Duke Power to gauge future customer requirements.

Edmunds and company are pushing the boundaries of net management; he's intent on a more flexible, scalable management system for Duke Power's big distributed TCP/IP network. Edmunds is a major Hewlett-Packard Co. OpenView user who's not afraid to speak his mind or shop around for a vendor that can actually meet his needs.

And Edmunds is in a unique position to speak his mind: He's president of the HP OpenView Forum user group. Unhappy with the scalability of OpenView, Edmunds recently made clear that he was shopping for another solution and considering switching to IBM's NetView for a large chunk of his network. Funny that after announcing his plans, HP offered him some concrete solutions to his scalability needs.

Edmunds still isn't satisfied, citing the fact that several of his net management stations are hitting application overload. "We need to push these processes out to multiple platforms that can truly communicate," he says.

Scalable, distributed management. Vendors, are you listening? You better be, because Edmunds and others like him are blazing new trails and aren't afraid to leave you in their dust.

LARRY ELLISON

Chief executive officer, Oracle Corp.

How do you make your desktop simpler without losing all your critical applications? Ellison knows. Put your applications on a World-Wide Web server and use a browser, rather than your Windows interface, to access them.

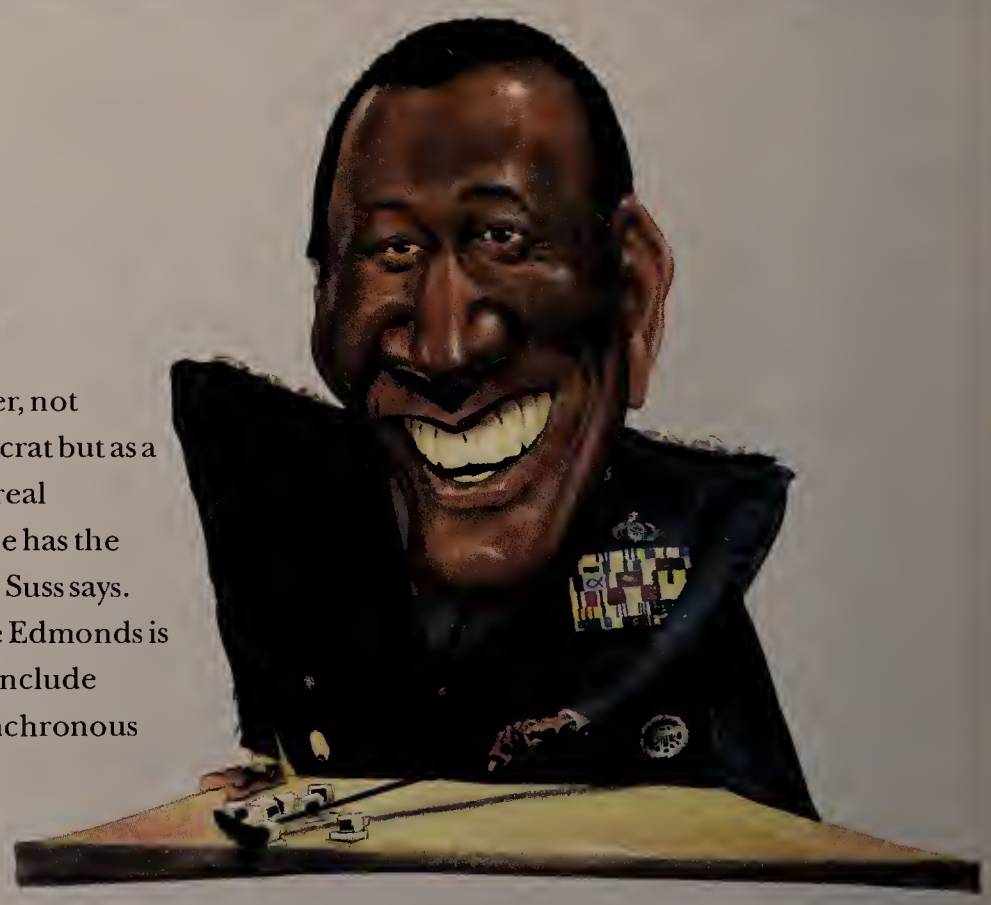
Oracle has always been a powerhouse in client/server computing, and now Ellison's leveraging the Web as another way to unsettle archrival Bill Gates. Ellison has been the most visible proponent of those newfangled Internet machines — inexpensive computing devices designed to hook into the 'Net — and he's laid out a soup-to-nuts Internet strategy that includes delivering a Web server, a browser and tools to write Internet applications.

"Ellison was way ahead of the curve on this one," says Richard Finkelstein, president of Performance Computing, Inc. in Chicago. "By putting all the complexity on a centralized server, you avoid desktop obsolescence and you simplify upgrades because applications are at a central location. He's delivering value."

But is the vision enough to propel this database giant into a leadership role in the Internet marketplace, where upstarts such as Netscape Communications Corp. will scrap with the firms that dominated earlier computing epochs? Whatever the outcome, count on Ellison to make the fight interesting.

MARSHALING THE POWER OF NETWORKS

Lt. Gen. Edmonds makes sure the military can communicate.



Lt. Gen. Albert Edmonds may be the ultimate power user.

As head of the Defense Information Systems Agency and manager of National Communications Systems for the Department of Defense, he's responsible for command, control, communications, computer and intelligence (C4I) support for all U.S. troops. His is a network to beat all networks, and the applications are *really* mission-critical.

Edmonds also is overseeing perhaps the largest network request for proposal on the planet — what consultant Warren Suss, president of Warren H. Suss Associates in Jenkintown, Pa., calls the biggest upgrade to Defense Department communications in some 20 years.

The next-generation Defense Information Infrastructure (DII) is a critical component of national security, and voice, video, data and multimedia are all part of Edmonds' network strategy.

Edmonds might be termed the "CIO to end all CIOs." His end users are war fighters, and the former U.S. Air Force data systems officer is concerned with getting the right information to the right person in the right mode.

"Edmonds is a street fighter, not coming at [DISA] as a technocrat but as a career military person with a real understanding of his users. He has the interests of soldiers at heart," Suss says.

Suss estimates the upgrade Edmonds is presiding over — which may include construction of a private Asynchronous Transfer Mode backbone net — will run to $5.5 billion. It also will "determine the future of networks, because what happens under [Edmonds'] watch will have a dramatic effect on the industry," Suss says.

Edmonds is particularly concerned with the Defense Messaging System and is pushing for extensions to X.400 and X.500 to get the robustness, protection and authentication the Defense Department requires for person-to-person communications and communications from commanders.

The lieutenant general is leading DISA into established patterns followed in the corporate world, shifting away from purchasing customized technology toward off-the-shelf gear to keep the military from getting locked into a proprietary solution. But he's doing it with a twist. He's pushing vendors to add features that really meet the needs of Defense Department users. For example, he is leaning on Microsoft Corp. and IBM/Lotus Development Corp. to build secure and interoperable versions of Notes and Exchange. That muscle-flexing may wind up benefiting rank-and-file customers, as well.

At a time when the military is cutting back on budgets, Edmonds "has succeeded in getting dollars going to information technology because it's seen as a force multiplier that provides more with less," Suss says.

By Paulina Borsook

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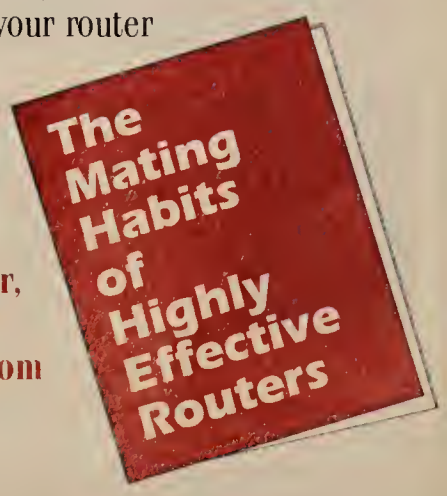

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WIZARD OF CHIPS PUSHES FOR BETTER NETWORKS

Intel's Grove wants nets to catch up to his microprocessors.

Andy Grove, chief executive officer of Intel Corp., is famous for his business philosophy that "only the paranoid survive." And his current paranoia centers on growth in the network industry. "We can only grow if we capture new users. Can we dream up new applications to make PCs more useful?" Grove asks.

Grove, whose microprocessors drive both the clients and servers in the client/server revolution, isn't waiting around for an answer. He's pushing hard for new network-heavy PC applications — such as desktop video via Intel's ProShare systems — that will keep demand for Intel chips high. And Grove's demanding better service for PC users from the network industry.

In 1968, this Hungarian emigre helped cofound the company that now claims 85% of the microprocessor marketplace.

Along with videoconferencing, Intel has become a force in the LAN/desktop management arena with the company's LANDesk tools.

Today, Grove is concerned about the discrepancy in the development of microcomputers and communications. Moore's Law — articulated by Intel chairman Gordon Moore — states that microprocessors will double in power every 18 months. Alas, no such rule applies to networks.

"Bandwidth is not keeping up with processing power," Grove says. If communications came down in price as computing has, "your long-distance bill would be 30 cents a month. My wireless bill is an atrocity," he says.

Adds Grove, "If we can have a $2,000 PC, there's no reason why everyone can't have his or her own ISDN line. What's holding this up? It's hardly technology or wiring. Bandwidth has not come down in price, and deregulation hasn't happened as of yet."

Grove says computers and communications are in a tornado-like spiral: Compute-rich applications drive up communications use. But "PCs got used very broadly, very rapidly, so there became an imbalance," he says. "The PC industry has doubled its performance at each price point for the last two years back-to-back. I'd love to see this happen in communications."

Count on Grove to help make it happen. From his bully pulpit atop the microprocessor industry, Grove will be a powerful voice for new network services that support all those muscled-up PCs.

By Paulina Borsook

F

ROBERT FRANKENBERG

President/Chief executive officer, Novell, Inc.

It's easy to take the helm when the water is calm and the weather clear. So give Frankenberg credit for guts. He took on the leadership mantle at Novell at a time when customers and pundits were scratching their heads at some of the company's acquisitions and strategy statements.

In a blind quest to compete with Microsoft Corp., Novell had stretched its product line and credibility too far. But in less than two years, Frankenberg has gotten things back on track, bringing Novell back to its core competency and giving it a clear strategic focus.

Not that he's guaranteed success. His firm's flagship NetWare product line faces brutal competition from Windows NT and Novell must deliver on big promises for future NetWare versions. But there's a lot to be said for the kind of market share NetWare commands, and Novell has powerful weapons of its own, such as NetWare Directory Services (NDS).

Frankenberg's strategy has entailed some pain. The company said goodbye to high-visibility acquisitions such as WordPerfect Corp. and the UnixWare unit. But analysts say that will keep resources focused on NetWare and NDS.

"Frankenberg's built a clear strategy, and you can't count them out. They have a tremendous installed base and a lot of loyal business," says Frank Dzubeck, president of Communications Network Architects, Inc.

G

BILL GATES

Chairman/Chief executive officer, Microsoft Corp.

The Road Ahead is on the best-seller lists. Windows 95 is making a big splash in the desktop arena. Windows NT is taking the server world by storm, leading Microsoft's push into the enterprise world. So why isn't Bill Gates happy?

The Internet, that's why. Gates wants to rule the Internet, which is changing our ideas about what's possible and may just be the thing that breaks Microsoft's stranglehold on the software industry.

Gates has scrambled to present a coherent on-line world view and turn the Microsoft ship into the Internet wind.

But woe unto any rival that underestimates the wily Gates. Microsoft can never be counted out of a market that centers around PCs and software. In December, Gates launched an all-out Internet assault, announcing more than 20 Internet-related products and technologies, including the beta release of its Explorer browser, a host of Internet-based business applications and even interactive consumer games.

Gates says Microsoft's goal is to "make Windows 95, Windows NT and Microsoft Office absolutely the best vehicles for doing business on the Internet." And if his track record on the desktop is any indication, Gates may just pull off his Internet power play.

According to one analyst, "Gates is a brilliant tactician, and he's certainly making the right moves."

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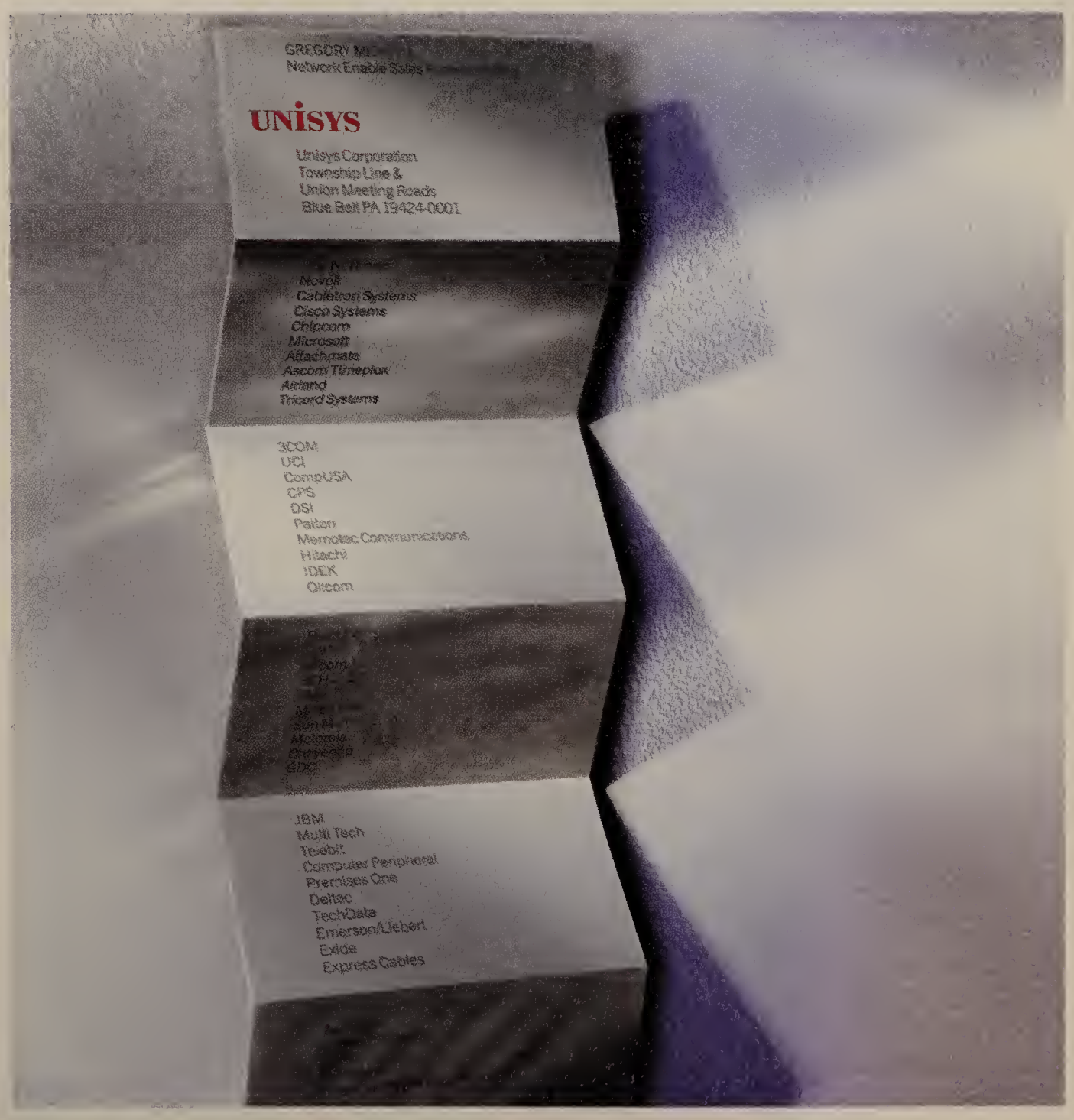

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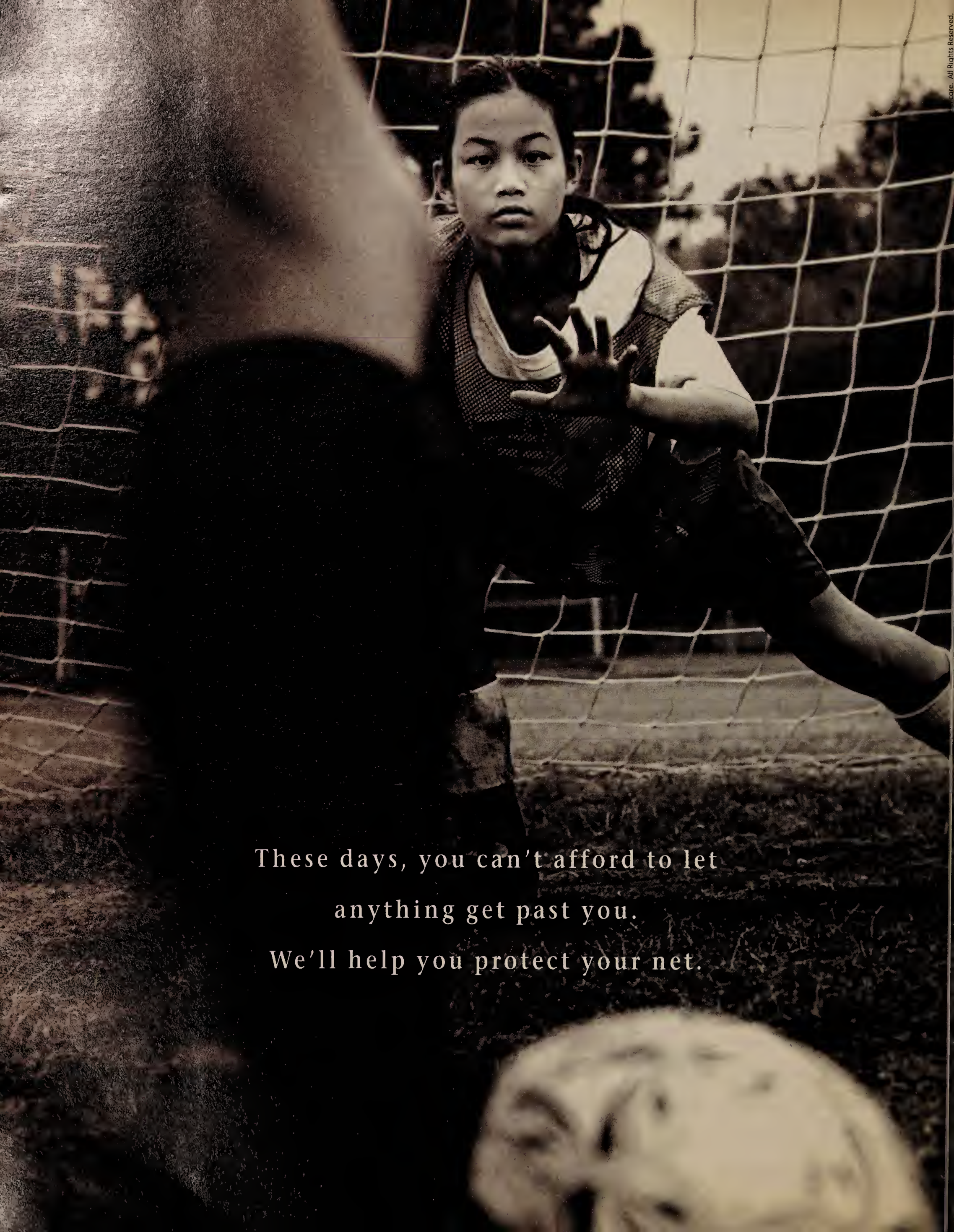

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DAWN LEPORE

Executive vice president/Chief information officer, The Charles Schwab Corp.

Any move to client/server is a dicey proposition. But completely revamping the computing/communications infrastructure for the top provider of discount brokerage services is something else entirely. It helps to have someone like Lepore at the helm. Lepore, who worked her way up through the information systems ranks at Schwab over the past 10 years, is known for her high-level technical savvy tempered by nuts-and-bolts business sense.

This unique combination enabled her to smooth the way for Schwab's client/server initiative, called Schwab Architecture and Migration Strategy (SAMS). The SAMS project rebuilt Schwab's IS function, moving critical transactions off mainframes and onto a nationwide network of servers and workstations.

"I don't think we could have gotten here without her," says coworker Betsy Snow, a senior vice president in IS operations at the brokerage. "Dawn has an excellent rapport with our partners on the business side. She has a great deal of credibility on both sides of the house."

She'll need it as Schwab moves into the next phase of implementation. "Our challenge is to build systems that can take advantage of this new architecture," says Snow. "The foundation is there, we just need to move onto the next step."

HANK LEVINE

Partner, Levine, Blaszak, Block & Boothby

Having someone on your team who can translate user requirements into sound network designs is of utmost importance. But having someone who can translate those sound networking requirements into fiscally advantageous contracts with the Big Three carriers is invaluable.

Levine helped found this Washington, D.C.-based law firm that represents major customers hammering out intricate tariff-based carrier agreements. Those deals will become even more complex in the coming year, especially in the wake of a recent Federal Communications Commission ruling requiring unbundling of equipment from frame relay and Asynchronous Transfer Mode service contracts.

"Users will not simply be doing more of the same kind of contracts," says Jim Blaszak, a partner in Levine's firm. "There will be more frame relay contracts, and more contracts that have to be structured to accommodate migration to new technology and services. If you don't deal with those problems in your contracts, you can get locked into a technologically obsolete deal."

That's where Levine's unique experience, knowledge and savvy come into play. He's a user's best ally when it comes to dealing with the pricing, terms and conditions that shape custom network contracts — something that clients such as Merrill Lynch & Company, Inc., The Prudential Insurance Company of America, Mobil Oil Corp., the Securities Industry Association, Goldman, Sachs & Co. and Time Warner, Inc. have already learned.

HACKERS BRING THE NET DOWN TO EARTH

Security concerns throw cold water on the information highway super hype.

There's a cliche that what doesn't kill you makes you stronger. So it is with hackers. Million-dollar movie deals and *New York Times* headlines aside, the real power of hackers hasn't been to bring down nations and industries, but rather to alert network vendors and customers that they ignore security at their own peril.

Whether you applaud their technical derring-do or decry their assaults on the sanctity of our computer systems, hackers have injected a healthy — although often painful — dose of reality into the "Body Network."

They've served as a governor on the sometimes-naive enthusiasm for electronic commerce, providing a valuable counterbalance to all the information superhighway hype. In the past few months, articles about the meteoric rise of Netscape Communications Corp.'s stock were offset, in part, by tales of hackers cracking Netscape's security and boring holes in our other electronic defenses.

Douglas Barnes, a "systems pathologist" for Electric Community, says the feisty young start-ups in 'Net commerce are "very technology-oriented but don't have the application background to be designing this [secure] software" for networked business. Electric Community is a Los Altos, Calif., start-up developing a platform for secure social and commercial interactions across networks.

"We've been too reactive," adds Charles Cresson Wood, an information security consultant at Baseline Software of Sausalito, Calif. "We need to be more proactive." Wood used to be network security officer for Bank of America.

London-based Annaliza Savage, a member of the hacker community and director of the hacker documentary *Unauthorized Access,* says, "Really good hackers can break into anything. But good security can keep out the lamers," or those who aren't that clever in the first place.

The problem, says Barbara Fraser, is that "the average systems administrator has a far lower level of technical expertise than five years ago. Security may now be his or her secondary job." Fraser is team leader for network security improvement tools and techniques with the Computer Emergency Response Team at the Software Engineering Institute of Carnegie Mellon University in Pittsburgh.

But with upper management pushing the electronic commerce agenda and hackers flexing their muscle, security may assert itself as a higher priority. If that happens, then the threat of hackers — real or imagined — may come to be viewed as a powerful force for good.

By Paulina Borsook

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IN CHARGE AT AT&T

Alex Mandl and Gail McGovern take the helm.

Sometimes it takes an outsider to make you realize the value of what you already have.

Alex Mandl is the first person to rise from outside AT&T's ranks to shepherd the company's core communications and information services business, which will stand on its own when AT&T sheds its computer and net equipment businesses in 1997.

But Steve Sazegari, principal of the Tele-Mac consultancy in Foster City, Calif., says Mandl has "the old AT&T in mind — trying to get it back to the glory before the breakup of the Bell system and the reorganizations."

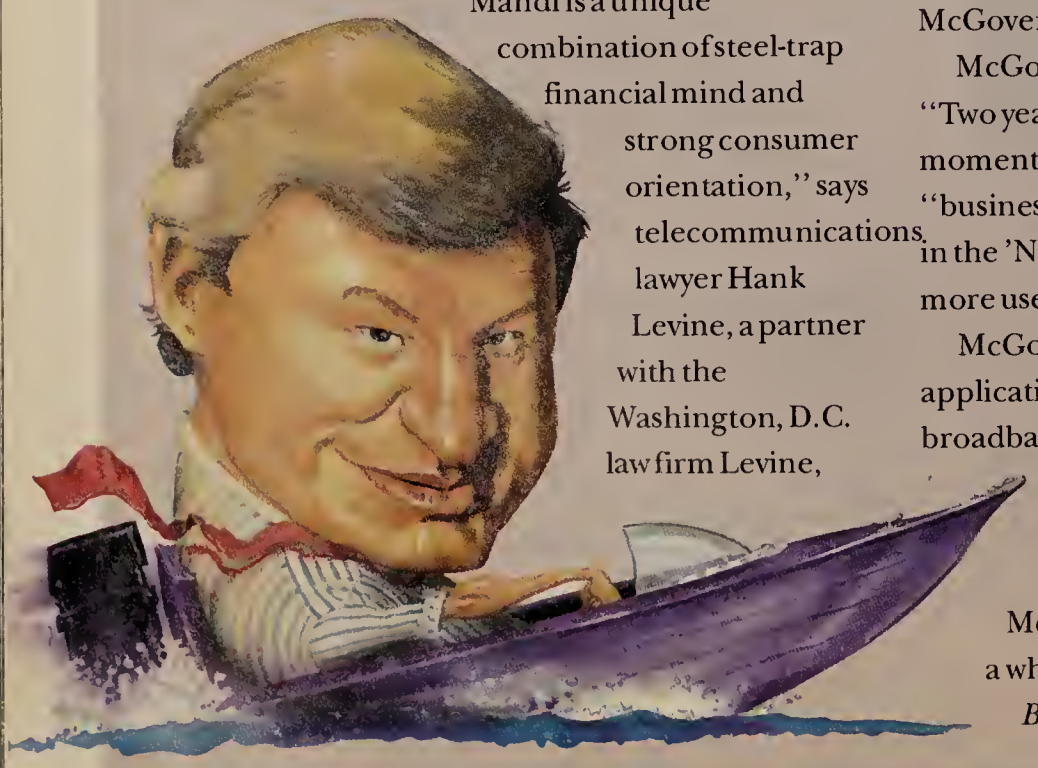
Mandl's AT&T will aggressively pursue customers in the local loop, and look at all sorts of ways to bundle wireless services, international networks, multimedia network services and even Internet offerings.

In short, Mandl's AT&T will be streamlined, freed from the constraints imposed by the current management structure and ready to take on the world.

Mandl came to AT&T in 1991 as chief financial officer and was the brains behind the fortuitous takeover of McCaw Cellular Communications, Inc.

Before that, he served as chairman and chief executive officer of Sea-Land, the world's largest ocean transportation and distribution company, where he doubled the size of the organization. There, the Austrian-born, U.S.-educated CEO used technologies such as electronic mail to increase efficiency and improve communications.

Mandl transformed the transnational corporation, modernizing it to thrive in a globally competitive marketplace. That experience will serve Mandl well as he shapes the future as AT&T's chief executive officer.



"Mandl is a unique combination of steel-trap financial mind and strong consumer orientation," says telecommunications lawyer Hank Levine, a partner with the Washington, D.C. law firm Levine, Blaszak, Block & Boothby.

"In corporations, as in Washington, the job can make the man," Levine says. With Mandl, who already has an impressive track record in the world beyond AT&T, it will be fascinating to watch how the man makes the job.

McGovern

Mandl won't have to shoulder all the responsibilities at the new AT&T. He'll have plenty of able assistance from Gail McGovern, the executive vice president heading AT&T's $20 billion-per-year Business Services Division. McGovern runs the networks that run corporate America and bring in so much of AT&T's revenues.

The holder of a bachelor's degree in theoretical mathematics from Johns Hopkins University and an MBA from Columbia University, McGovern began her career as a programmer with Ma Bell in 1974.

She has some unusual ideas about how to build on AT&T's longstanding competitive assets. In particular, she feels voice is a force not to be underestimated.

"Voice is the ultimate [graphical user interface] — linking it with telecommunications is very natural," she says. McGovern says voice technology embedded into network applications could provide the ease of use consumers need in electronic commerce.

"I'm fascinated with speech recognition. It doesn't get as much hype as on-line [technology], but it will fundamentally change the way people live and work," McGovern says.

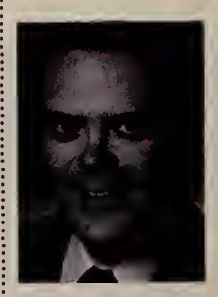
McGovern is optimistic about on-line commerce. "Two years ago there was too much hoopla," but its moment has arrived, she says. But she maintains that "business customers are looking for more intelligence in the 'Net," meaning that cyberspace needs to become more useful for business purposes.

McGovern says no one can foresee the killer network applications of the near future, but she thinks broadband to the home will be a key driver. "New ideas come from technologies, from customers and from salespeople. But bandwidth is key — everyone needs more bits," says McGovern, whose unit will deliver those bits and a whole lot more.

By Paulina Borsook

BERT ROBERTS, JR.

Chairman/Chief executive officer, MCI Communications Corp.



Roberts has guided MCI through a series of strategic moves designed to help the nation's second largest long-distance firm sustain its growth into the future. First, he sold 20% of MCI's stock to BT and launched Concert to sell global network services with the British carrier. Then he launched MCImetro to compete in the local-access market, and entered joint ventures in Canada and Mexico to build a net spanning North America. He also bought cellular reseller Nationwide Cellular and invested $2 billion in Rupert Murdoch's News Corp. for content to send over MCI pipes.

Roberts says all this will buoy MCI at a time when long-distance is suffering tight margins and fickle customer loyalty. So far, stock analysts are less than enthusiastic. But as everyone who's come up against MCI knows, betting against a vision can be a losing proposition.

PAUL SEVERINO

Chairman, Bay Networks, Inc.

Severino is viewed as the strategic mastermind behind one of the network industry's top three hardware suppliers.

Formed in October 1994 through the marriage of leading hub maker SynOptics Communications, Inc. and Severino's router powerhouse, Wellfleet Communications, Inc., Bay is thriving these days. Even rivals grudgingly concede that Severino and company made the merger work.

But Severino isn't finished. He's constantly tweaking Bay to ensure it remains a switching/hubbing/routing power to be reckoned with well into the future. He recently engineered two acquisitions for Bay: Centillion Networks, Inc., a token-ring switch vendor, and remote access company Xylogics, Inc.

BOB STEARNS

Vice president, corporate development, Compaq Computer Corp.

Stearns who has steered Compaq so deftly into the networking arena. Stearns, who oversees strategic planning and business development for the world's top supplier of PCs and servers, has been extremely busy this year. He realized early on that client/server computing and internetworking were future growth areas for Compaq, and laid plans for bulking up the firm's servers with new networking capabilities. Also, he engineered the acquisitions of two net suppliers: net interface card and hub maker Thomas-Conrad Corp., which launched the formation of Compaq's new Internetworking Products Group; and fast Ethernet hub and switch maker NetWorth, Inc.

"Bob is a behind-the-scenes strategic planner who influenced the company to get into networking," says Frank Dzubeck, president of Washington, D.C.-based Communications Network Architects, Inc. "It's a smart move because it increases the value of their servers."

Joanne Cummings is a freelance writer in Marlborough, Mass.

It's rare that the impetus for a major strategy shift comes from someone other than the CEO. But those in the know say it is

MR. MUSCLE

John Thompson did such a good job repositioning IBM's hardware — it was Thompson who came up with the idea of hyping mainframes and minicomputers as servers — that he was given the same Mr. Fixit task with the company's entire software line.

Senior Vice President Thompson is responsible for IBM's Personal Software Products, Networking Software and Software Solutions units, as well as the new Internet Division. With his broad product lineup, which includes Lotus Notes, cc:Mail and desktop applications, IBM has a fighting chance against Microsoft.

Consultant Jim Norman, president of Norcom Consulting in Alexandria, Va., says Thompson is the best person within IBM to "take advantage of the gorgeous breadth of their software portfolio and get disparate software [lines] to work together." And remember, IBM had worldwide software revenues of $11.3 billion in 1994 — making it the biggest software company on Earth.

Part of "Gerstner's Inner Circle," Thompson has already demonstrated some smart moves, such as hiring Gian Carlo Bisone from Compaq Computer Corp. to head up group software marketing.

Also, the promotion of Mike Zisman from within Lotus to head up the Lotus division — rather than a career IBMer — was a "great decision. He's highly regarded in the industry," says Dave Marshak, an analyst with Patricia Seybold Group, Inc. in Boston.

Norman says that with Thompson at the helm, "I'm bullish. The guy's good."

By Paulina Borsook

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208	209	210	211	212	213	214	215	216

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ELEVENTH ANNUAL USER excellence AWARDS

Panhandle Eastern taps the power of client/server

By Charles Bruno

Some employees take work home; Dana Grogan took hers to bed.

Grogan, a project leader in the Business Systems unit of Panhandle Eastern Pipe Line Co. (PEPL), had been working 12- to 16-hour days on a client/server migration effort. She recalls sitting down at one staff meeting only to find her coworkers clad in pajamas and bathrobes.

"We were spending so much time at the office, I thought the dream was real," she says.

Grogan wasn't the only IT staffer to dream about the company's client/server escapades. Other coworkers sheepishly recount their own bizarre episodes. But what Grogan and her peers didn't foresee in their dreams was the phenomenal business impact the client/server project would have on the company's bottom line.

Consider this: Billing errors have plummeted more than 50%. The cost of paper handling has declined 25% due to improved collaborative computing technologies and online data. And PEPL's Link Customer Interface System, a bulletin board system that provides a virtual marketplace for buying and selling natural gas, has earned top honors from users as the industry's best BBS.

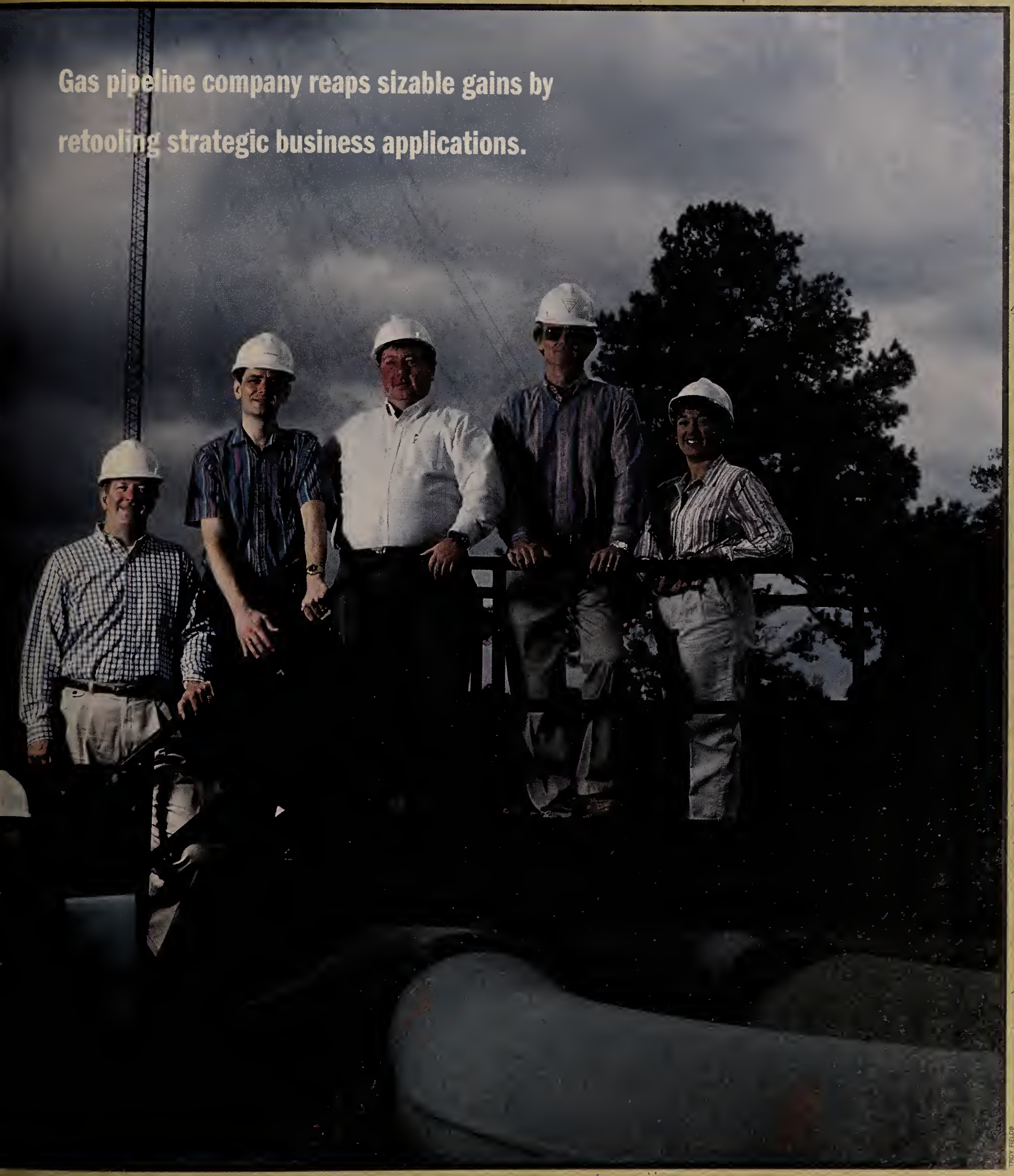
The client/server shift is also generating savings within

Continued on page 58

▲ **Project leaders** *Grogan, Baugher and Carr provide net services to internal and external customers.*

Panhandle *Eastern's IS team of Bruce Woodlan, Robert Ricketts, Scott Pittman, Tom Neimann and Claudia Gattis devised a client/server architecture that tightly integrates field data with customer information.* ▶

Gas pipeline company reaps sizable gains by retooling strategic business applications.



TROY FIELDS

Continued from page 56

the IT department. The cost of technology has dropped by 60% as distributed PC-based systems oust more costly mainframe-oriented gear. And support staffs have been reduced by attrition to 30% of their prior levels. More importantly, software changes and application upgrades are now implemented in hours or days, rather than weeks or months.

In 1995 alone, PEPL expects to have saved about $4 million by operating distributed database and other applications on client/server platforms, rather than isolated Unisys Corp., IBM and Digital Equipment Corp. hosts.

"This was the type of job you could see would be one of the top five projects of your career," says Claudia Gattis, manager of strategic technology for PEPL Systems.

Cleaning up the mess

Ironically, in an industry that cries about being overregulated, it was a 1991 federal order that started PEPL down the client/server path.

The company, with its 10,000-mile pipeline, is not only a major player in the interstate natural gas transport business, but it also stores, compresses and processes gas for local providers and other customers.

Federal Energy Regulatory Commission (FERC) Order 636 called for gas pipeline providers to unbundle their rate structures, allowing customers to order on an a la carte basis, rather than forcing them to pay for a package of pipeline and transmission services.

"That got us looking at how we handled gas distribution, how we accounted for usage and how we handled all the data," says Bruce Woodlan, director of PEPL Systems. As a result, PEPL uncovered waste — $3 million of redundant data in a company with a $12 million IT operating budget. That culprit was measurement data from gas wells and statistics on gas consumption that resided on three different computing platforms.

Worse yet, all the data didn't exactly jibe. "You could ask four or five different people the same question about a well and you'd get four or five different answers," Gattis says.

Corporate management issued an edict to clean up the data mess. Its orders were to stamp out data redundancy, eliminate the overhead of multiple computers, improve documentation of gas well data and put an end to the inaccuracies.

"It was a directive for a major mission-critical application for a major change in the technology," Woodlan says.

So Woodlan's band of IT professionals set off in pursuit of a lofty goal: create business applications that increase customer service capabilities, reduce the costs of maintaining the technical infrastructure, adapt to changing business conditions rapidly and eliminate the reliance on proprietary products.

PEPL planned to embrace a blend of technologies including client/server databases, workflow automation and geographic information systems. With an eye toward meeting the FERC requirements by January 1993, when they took effect, PEPL began work on its Gas Transportation System (GTS), the centerpiece database application.

But a wrong turn with distributed databases set the company back a few months. So did FERC's failure to clarify tariff structures until just before its order went into effect. Consequently, PEPL didn't start pushing out GTS until October 1993, forcing it to use a modification to its older mainframe applications.

"If we were guilty of anything, it was trying to do too much too quickly," Woodlan says.

In unison with PEPL's shift to client/server applications, the company began making changes to the physical network infrastructure to better accommodate the new applications.

In early 1993, PEPL decided to adopt TCP/IP as its chief protocol and migrate away from a mix of proprietary protocols. The company adopted NetManage, Inc.'s Chameleon package, which is now available on all local and remote users' PC's. That left Scott Pittman, senior communications engineer, and his colleagues with two sets of concerns.

"We had to account for the impact of the new protocol on both local folks and people in the field," Pittman says. While local users enjoyed LAN response times, users over the WAN would need more bandwidth. So PEPL bit the bullet and installed a DS3 microwave net up and down its 10,000 miles of pipeline.

PEPL also decided to upgrade its local 16M bit/sec token-ring backbone with an FDDI ring and replace internal bridges with routers.

JAM sessions

With the network going through an upgrade, PEPL assigned Mike Cullen the task of architecting a software development strategy.

"Rapid application development is the key," says Cullen, senior petroleum engineer for technical development. "People don't want to wait around two weeks for a program change."

Cullen pared down PEPL's nine-level software architecture to just one — a class library structure. Class libraries allow developers to define a piece of code as an object, store it as part of a group of common elements and bolt it into a new application when needed, as opposed to rewriting the routine.

"They also reduce the overhead associated with executing the code," Cullen says.

The company opted for Powersoft Corp.'s PowerBuilder as the front-end development tool for internal applications and JAM, a SQL-based development tool by JYACC, Inc. that supports character-level presentations.

JAM supports external applications, such as those written for customers and suppliers.

"Our aim was to create an environment so the developer does a minimum of coding," Cullen says.

Applications written to either front end issue calls to a Sybase, Inc. SQL Server and SQR report generator.

Cullen's goal has been to keep the software architecture simple for rapid application development and because the company leaned heavily on third-party contractors to generate early applications. The development team is now down to about a dozen people from a high of 70 a few years ago, but still is responsive to user needs. "If they must have the software change this afternoon, they'll get it," Cullen says.

While Cullen was instrumental in getting the applications coded, Robert Ricketts was busy designing the applications that would be developed and even writing some badly needed network programs.

Ricketts, senior open systems architect, took up the challenge of converting 500 Banyan Systems, Inc. VINES clients — with hooks to legacy applications — to a Windows environment.

Rather than try to move users cold turkey from their DOS or legacy environments to Windows, Ricketts and Gattis decided to implement a menuing system.

They also hunkered down with end-user representatives to decipher the full range of application needs.

The two realized they would have to build some network services that just didn't exist at the time.

"We needed to provide guaranteed delivery of an application to a user," Gattis says. "So we had to invent our own version of software distribution tools because there just weren't tools like [Microsoft Corp.'s Systems Management Server] around."

PEPL adopted FCOPY, a standard DOS utility that checks file data and time stamps to determine if a PC needs upgraded software. Ricketts saw the need for a similar utility for Windows applications based on PowerBuilder, so he wrote Client/Sync, a utility that automatically upgrades users when a PC is

Continued on page 60

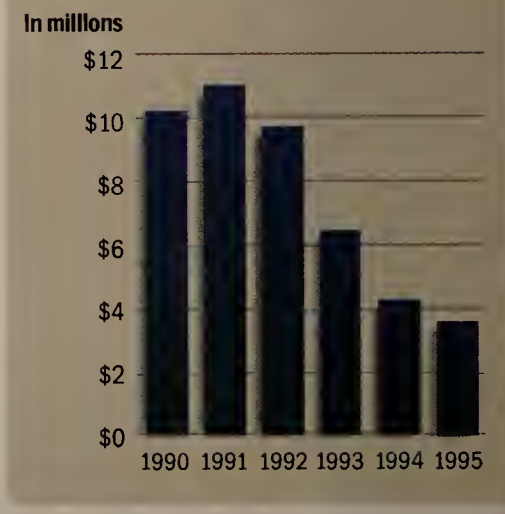
PEPL'S CLIENT/SERVER SAVINGS

	Millions of dollars				
	1992	1993	1994	1995	1996
Mainframe costs	$5.9	$6.1	$6.4	$6.6	$6.9
Client/server costs	$6.72	$9.77	$5.3	$3.7	$3.9
Savings (increase)	($.82)	($3.67)	$1.1	$2.9	$3.0
Additional savings*		($.15)	$1.1	$1.2	$1.3
Total savings	($.82)	(3.82)	$2.2	$4.1	$4.3

*Follow-on savings generated by reduction in paper handling, and increased efficiencies due to introduction of workflow automation, enterprise information system and geographic information systems tools.

SOURCE: PANHANDLE EASTERN PIPE LINE, HOUSTON

PEPL'S COST OF COMPUTING



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While you're there, you'll also find stories on the most recent crop of User Excellence Awards winners, so you can see how networking has helped them become more competitive, productive and responsive to opportunities.

There's also more information regarding this year's winners, including tips from Panhandle Eastern Pipe Line's Bruce Woodlan on how to migrate to a client/server architecture, and links to an on-line synopsis of the firm from Hoover's Company Profile Database. You'll also find links to Hoover's profile of Ryder System and to Ryder's home page.

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ELEVENTH ANNUAL USER excellence AWARDS

Continued from page 58

booted up.

Ricketts and Gattis decided to test their new services one evening after most employees left the office. That fateful day, about 50 to 60 volunteers hopped on networked workstations to test the software distribution feature, each issuing calls for the GTS file, which weighed in at more than 11M bytes.

"Needless to say, we cratered the ring," Ricketts says. "We took the old sledgehammer approach; if 100 users needed software, they got it at once."

Adds Gattis, "It forced us to reassess how to deliver the applications."

In addition to software distribution, Ricketts and Gattis decided the company needed an enterprise backup facility for users' hard drives.

"We wanted something completely automatic; we didn't want to leave it in users' hands," Gattis says.

PEPL standardized on SafeSource, a homegrown application that allows users to define the frequency of backups for their local hard drive, after which the software handles the procedure.

All the blood, sweat and dreams that went into the client/server infrastructure are now paying off. Rather than dreaming of IS meetings-turned-pajama parties, Grogan is now riding herd over the GTS applications that support engineers at gas wells in the field.

Perhaps here, more than in any other area, the payoff of client/server is evident, Grogan says. "It just makes application processing so much quicker." Tasks that were done in 10 to 12 hours are now being churned out in 2 or 3, she says.

And the first day the company cut over to the Sybase database application at the gas wells, the company processed five times as many orders as with the older Unisys system.

The company also performs a process called valuations to assess the type and quantity of gas charged to specific customer contracts. The old Unisys mainframe ate up 40 hours crunching away at gas valuations. The distributed server setup cut that to 12 hours initially and ultimately, to 6 once some Sybase stored procedures were used to fine-tune the application.

"At the heart of it all is less overtime for the guys running the wells," Grogan says. GTS gives field supervisors more information than they ever had and in a fraction of the time. "That means people at the well aren't working extended hours to figure out how much they can pump the next day and who they can give it to," she adds.

Additionally, the company has eliminated the Unisys mainframe and IBM 4381, while also reducing the reliance on an IBM 3090.

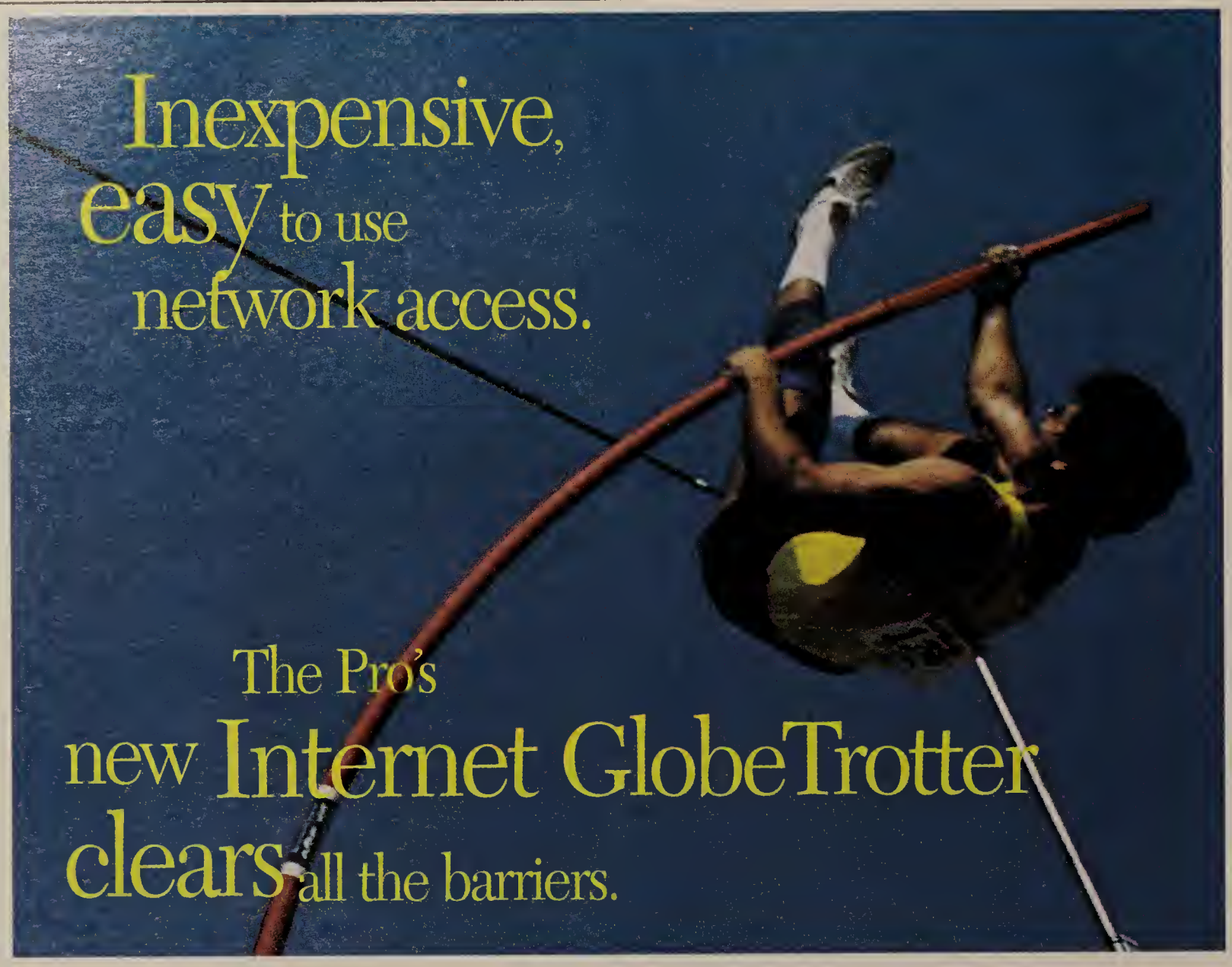
Cost of ownership for net computing has decreased 20% per year between 1993 and 1994. That's not to say the client/server migration came cheap; quite the contrary. PEPL invested a little less than $4.6 million between 1992 and 1995. But the savings have begun to build since then. In 1994, Woodlan says, client/server saved the company $2.2 million, and in 1995, the savings are expected to be just over $4 million, with projected savings of about $4.3 million for 1996.

Woodlan points specifically to areas such as billing, which had sagged under the old setup. The system was so congested it would spit out scores of prior month adjustments (PMA) — an indication the system could never catch up. In addition to cutting billing errors by 50%, "we've virtually eliminated the PMAs," Woodlan says.

The system now has tighter integration with the company's other applications, so billing is pegged to actual usage, complies with contract clauses and invokes penalties when applicable. Before, PEPL didn't have solid data to enforce penalties.

The success of his team is now being recognized by the company's parent, Panhandle Eastern, which is beginning to showcase PEPL's client/server savings to other business units.

But the most satisfying gain, Grogan says, is knowing that internal users value the applications. "It makes all those lost days and nights worthwhile," she adds.



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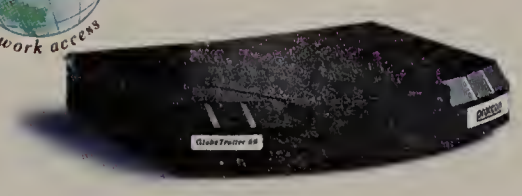

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Anthony DeLima *(left) and James Hamilton are the driving force behind the RyderLINC team (below), which has proven the power of frame relay and client/server networks.*

ANDREW ITKOFF/ZUMA

ELEVENTH ANNUAL USER excellence AWARDS

Ridin' high

New net infrastructure has Ryder in the driver's seat, ready to meet any business need.

By Paul Desmond

A Ryder System, Inc. salesman on a call in Kansas City needs historical information on his customer's Ryder truck. The truck lease is up for renewal, and the salesman has to decide whether it makes sense to extend the lease on the same truck or sell the customer on a new one.

From his laptop, he taps into a mainframe database in Miami and downloads historical data on the truck. It's getting up there in age, closing in on 100,000 miles. He checks the maintenance record and sees it's pretty clean. But checking another database with performance data on the same model truck shows it's overdue for some major repairs.

With a few more keystrokes, the salesman works out figures for a lease on a brand-new truck. It's not a whole lot more, and, armed with the performance forecast on the existing truck, he convinces the customer it's a good deal. The customer won't suffer any downtime, and Ryder now can perform preventive maintenance on the old truck before selling it off at a decent price.

This is what RyderLINC hath wrought.

RyderLINC is a $20.5-million frame relay-based network that has Ryder in striking position to attack and implement virtually any application it sees fit.

The asset management application that is central to the above scenario is a shining example of the network's power: The program gives Ryder employees simplified access to corporate data, enabling them to make better decisions faster. It should increase profits enough to pay the entire RyderLINC tab within two years, says Anthony DeLima, group manager of technical planning and integration at the company.

It is that kind of marriage between business need and technology solution that has won DeLima and his team a share of the top honors in the 1995 *Network World* User Excellence Award Competition. To fully appreciate the importance of RyderLINC, you first have to understand that

Continued on page 64

ELEVENTH ANNUAL USER excellence AWARDS

Continued from page 63

Ryder does more than rent trucks. In fact, consumer truck rentals account for less than 10% of its overall revenue, according to a company spokesman.

Its biggest chunk of revenue (35%) comes from full-service truck leasing, which often includes financing, ongoing vehicle maintenance, and the screening and hiring of drivers, to name a few services.

The company also offers cradle-to-grave logistics services, helping customers such as Whirlpool Corp. and Xerox, Inc. determine the most efficient way to move raw materials to manufacturing plants and finished goods to retail shelves, then lining up various carriers to make it happen.

Roughly 14% of Ryder's revenue comes from its automotive carrier business — those double-decker trucks that move cars to dealers. Another 13% is in public transportation — Ryder is the second-largest carrier of school buses in the nation, for example.

Ryder guarantees its customers three things: a measurable level of performance, cost savings and gain sharing, which is a split of any profits above those spelled out in the contract.

RYDER ESSENTIALS

Revenue: $4.7 billion
Earnings: $154 million
Total assets: $5 billion
Vehicles: 190,000
Employees: 43,095

SOURCE: RYDER 1994 ANNUAL REPORT

"Our ability to do what we promise is all predicated on IT," Dawson says.

That's because, to a large extent, data drives Ryder's business.

Consider logistics, which with its growth rate of 40% is the fastest growing unit. Ryder is charged with not only figuring out how to move materials in the most efficient manner, but also at the best price. That means it needs detailed data on the customer's needs as well as pricing data from the various railroad and other transportation companies involved.

Likewise, Ryder has to keep track of its own assets, which largely comes down to trucks. It has to calculate when to buy new trucks, how long leases should run, when to schedule maintenance and when it's cost-effective to sell the vehicle, DeLima says.

For years, Ryder has been collecting the data required to perform all those calculations. The problem is, it's all over the place. Some is stored in IBM mainframe IMS and DB2 databases at headquarters. Other pieces are in Application System/400s located at the 79 regional or district offices, or even at satellite sales and marketing locations that report into the districts.

Enter SAM, the Simplified Asset Management system.

"SAM is the compelling reason that a lot of our [internal] customers needed the RyderLINC infrastructure," says Jim Hamilton, RyderLINC product manager.

SAM takes advantage of core RyderLINC services, including database middleware, mainframe gateways and distributed Novell, Inc. NetWare servers, to make it easy for Ryder personnel to find the data they need. It can be used by office-bound personnel sitting at PCs and laptop toting salespeople in the field. Like all RyderLINC applications, it is based on a Windows 3.1 client with the usual simple-to-use point-and-click features.

That's about all that's simple about SAM, however.

To make it work requires that hoards of read-only mainframe data be replicated monthly to NetWare servers located throughout the Ryder empire. That's done using Trinzic Corp.'s InfoPump, which was selected after a painstaking evaluation process, typical of the way Ryder selects any product.

When a salesperson runs a query on a given vehicle, a software agent on the client determines which database needs to be accessed. The agent uses Ryder-developed algorithms that, based on the function requested, can determine which databases the client needs to access. Information Builders, Inc. EDA*SQL middleware, running on both the client and the mainframe, enables the agent to extract data from host-based DB2 and IMS databases (see graphic, page 66).

This easy access to enterprise data helps Ryder personnel better track vehicle performance, trends, statistics and running costs, as well as identify differences between various types of customers, says Steven Bjerke, director of vehicle administration and SAM project leader. Built-in exception reporting capabilities also help highlight underperforming vehicles.

In just the few months it has been in use, estimates indicate SAM has already made Ryder more than $3 million in profits. "Our estimate is there will be $12 million and change in '96 and each year thereafter," DeLima says.

And that's just one RyderLINC application. There's also an accident reporting and claims processing program, as well as account management, financial systems, dealer development manager and vehicle purchasing applications that will further boost the value of RyderLINC.

It was these kinds of applications, and resulting profits, that Ryder had in mind when it first conceived of RyderLINC some three years ago as part of a massive business process reengineering effort.

Ryder's existing network wasn't up to the task. It relied mainly on the Advantis value-added network to connect AS/400s at the 79 regional and district offices to mainframes at the Miami headquarters. Sites were connected to Advantis via 9.6K bit/sec dedicated lines, which were simply not fast enough to support the kind of client/server queries and mix of protocols the company had in mind.

RyderLINC, by contrast, is based on 56K bit/sec frame relay links provided by MCI Communications Corp. Cisco Systems, Inc. 4000 or 2500 routers sit alongside Cabletron Systems, Inc. MicroMMAC hubs in remote sites. They support NetWare LANs and the AS/400s, tying it all to the frame relay net.

Headquarters is tied into the frame relay cloud by four T-1 links to four Cisco 4500 routers. The routers, in turn, are linked to four Cisco 7000 routers and Cabletron MMAC hubs that support FDDI and token-ring LANs in a collapsed backbone configuration. The backbone links local and remote PC users to a morass of headquarters-based AS/400s, RISC System/6000s, NetWare

Continued on page 66

ONE WILD WEEKEND

In any network project, there comes a time when you've got to cut loose the old and start relying on the new. Often, that's a gradual process — you may have trouble pinpointing the actual cutover point.

Not so with RyderLINC. In a single weekend — from late Friday, Aug. 18 to early Monday, Aug. 21 — the Ryder System, Inc. team swapped 79 IBM Application System/400s scattered throughout the country from a 9.6K bit/sec WAN supplied by Advantis to a 56K bit/sec frame relay net from MCI Communications Corp.

Such a "flash-cut" strategy was not without risk. "The down side, if you want to put it in plain English, is we could've crippled the company," says Anthony DeLima, group manager of technical planning and integration at Ryder.

Each AS/400 was already attached to an Ethernet LAN, which, in turn, was connected to a router supplying the wide-area frame relay link. But the AS/400s were configured to employ the Advantis link for communicating with the mainframe at headquarters. During the flash-cut, each had to be reconfigured to start shipping wide-area traffic over the frame relay net. Likewise, changes were required to VTAM on the mainframe as well as other components.

In all, some 24 acceptance tests had to be performed for each AS/400.

"At 4 a.m., we were walking around with acceptance sheets and shouting out AS/400 numbers," DeLima says.

One test turned up a router configuration problem. "That was a little gotcha we figured out with the help of some Cisco people we woke up in the middle of the night," says Steven Underwood, consultant, technology planning and integration at Ryder.

All the while, the team had to deal with routine chores, such as a software upgrade scheduled for one AS/400. After that AS/400 was cutover to the frame relay net, a programmer was given the OK to start the software download.

"He was expecting about an 8-hour download," Underwood says. "I think it went down in 23 minutes. That's when we realized we had a tiger by the tall."

SHOULD WE FLASH-CUT?

PROS

- ▲ Eliminate Advantis expense (estimated at $135,000).
- ▲ Enable RyderLINC quicker.
- ▲ Bulk of conversion was complete.
- ▲ Dual Ethernet/frame relay nets were unpredictable.
- ▲ Fallback plan was available.
- ▲ Vendors were available for concentrated window.
- ▲ Frame relay net was loaded successfully.

CONS

- ▼ Weekend windows were needed.
- ▼ Actual flash-cut time is only 7 hours.
- ▼ Impacted areas include:
  - AS/400-to-AS/400 communications
  - AS/400-to-mainframe communications

As noon Sunday approached, it was decision time. Noon was the beginning of a 19-hour fallback window during which the company could revert back to the original Advantis setup if it appeared the flash-cut would not be successful. The team opted to press on.

"At 6 a.m. Monday, business locations started to open up, and we knew we'd been successful," DeLima says.

By Paul Desmond

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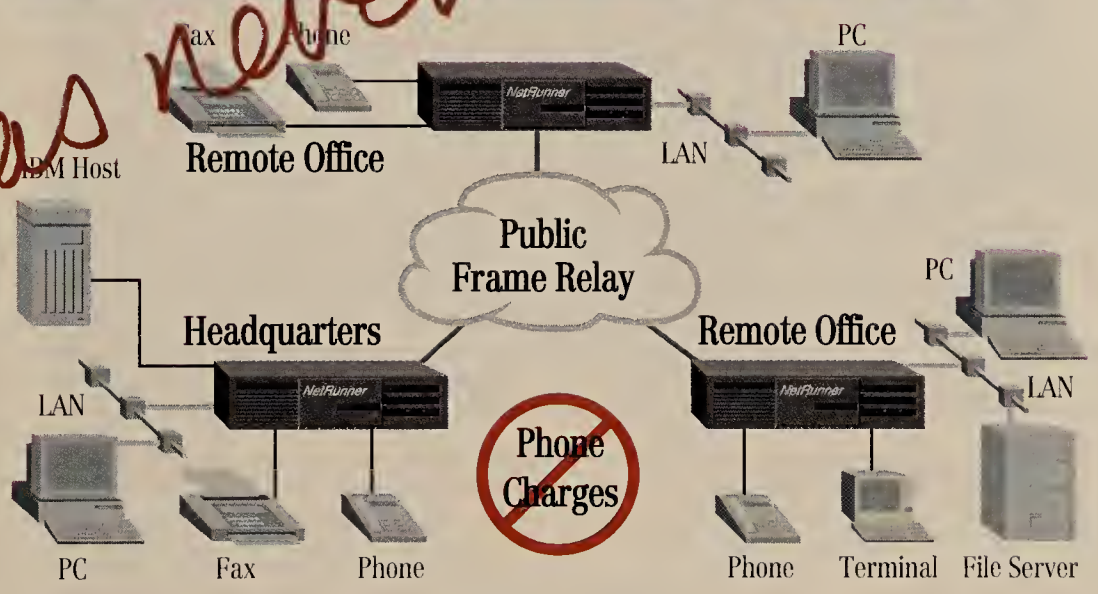

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Continued from page 64

servers and IBM mainframes. Dial-up access is provided primarily via a pool of ShivaCorp modems.

As of Nov. 1, 786 client machines were taking advantage of this RyderLINC infrastructure, with about 4,000 more planned by the end of 1996.

Project management primer

The rollout of RyderLINC would make for a project management textbook in which words like "planning" and "teamwork" keep cropping up.

"I really think the thing that made it successful was the teamwork," says Ruth Flinn, project manager, field systems implementation.

Echoes Steven Underwood, consultant, technology planning and integration, "It involved teamwork at all levels."

"People wanted to make sure that we would not fail, we could not fail," DeLima says. "This was one of the few times that Ryder opened up its wallet and said, 'We're going to invest in pure technology here.' And the teams said, 'We're going to make it happen.'"

The teams he refers to are the 12 project teams. As part of the planning process, the RyderLINC project was broken down into 12 subprojects:

- Initial integration
- TCP/IP integration
- Support processes
- Headquarters infrastructure
- Security
- Systems management
- Performance tuning
- Network rollout
- Site equipment rollout
- Acceptance testing
- Centralized enterprise data
- Ongoing capacity planning

That strategy made it easier for Ryder to achieve another key goal, which was to identify all the key technical issues to be addressed. Team leaders, dubbed process owners, attended weekly meetings to deal with any technical issues that crossed team boundaries, such as an EDA*SQL upgrade that affected other software components, or router updates.

"Cisco made five revisions throughout our rollout schedule," DeLima says. "As they changed, we made sure we were up-to-date."

To gauge how the project was progressing from a higher level, a steering committee comprising representatives from various technical disciplines met biweekly.

Another key was the establishment of a project office, which acted as a sort of clearinghouse for the project, holding the master schedule and, most importantly, the purse strings. In a project of this size, DeLima says it would have been easy for departments to hide expenses incurred elsewhere by attributing them to RyderLINC. Requiring project office sign-off on all expenses prevented that; RyderLINC came in about $600,000 under budget.

"We could get a snapshot of where we were at, to the penny, at any point in time," DeLima says.

But it wasn't just internal communications that made the RyderLINC rollout a success; vendors were also encouraged to hash out Ryder-related issues with one another.

"It was not uncommon to have a guy from Cisco have lunch with a guy from MCI and talk about Ryder," he says. "That was critical to us — the vendor communication outside of Ryder."

Likewise, Ryder worked closely with Entex, a value-added reseller that helped ensure the company did not fall victim to vendor cycle times. For example, Entex held on to a slew of Toshiba 4900 laptops after Toshiba Corp. announced it would no longer manufacture that model.

The strategy insulated Ryder from having to deal with bugs that crop up with new, untested systems. "It gave the industry time to scream," DeLima says.

But perhaps more importantly, it gave Ryder time to conduct a thorough certification process. "Vendors come out with new PCs about every six months," says Wilbert Williams, group project manager. "It's challenging to certify PCs that rapidly."

Ryder has four people whose sole responsibility is to make sure software and hardware components play nicely together. Only "well-behaved" applications get certified, and all end users are warned that installing uncertified software, and mucking with memory or configuration settings, may adversely affect performance.

"We ask, 'Are you willing to live with a little restriction in order to ensure your applications will function and fly every day of the year?' Most of our users have said yes to that," Hamilton says.

A good psychiatrist

The certification process goes hand-in-hand with the RyderLINC imaging concept — a way of ensuring consistent PC configurations that is crucial for optimized, reliable performance.

Once hardware and software components are optimized, the configuration is copied onto an 8-mm digital audio tape. Images are created for every platform to be supported, including the Toshiba laptop and Compaq Deskpro. Software is then loaded in the field from the 8-mm tape.

This is especially important since Ryder is pushing the envelope in terms of what Windows 3.1 clients can handle; there is no room for error. As of November, 26 custom and off-the-shelf applications had been certified as RyderLINC-compatible.

"We butted our heads against things like memory constraints, all kinds of different optimization challenges, environment constraints and path links," says Joel Steigelfest, integration consultant, technology planning and integration. "Everything we did, we basically had to watch our heads because we kept banging it on the ceiling."

"We stretched the Windows 3.1 environment probably as far as anyone has stretched it," DeLima agrees. "We took this to Redmond, and I think they were impressed."

"First they wanted to recommend a good psychiatrist," adds Ryder senior analyst Ben Aguero.

All this planning and preparation was put to the ultimate test one weekend last August during which AS/400s at the 79 remote sites were cut loose from the Advantis network and brought up on the frame relay net. At 6 a.m. on Monday, Aug. 21, RyderLINC roared to life (see story, page 64).

Down the road

But for Ryder, the story is far from over. The company is working furiously to enhance RyderLINC and bring up new applications that take advantage of the infrastructure.

Those changes will include a move to an "n-tier" architecture and potentially a shift to Windows NT-based clients and servers.

The n-tier architecture, which allows for a varying number of layers, would move data management functions and a good chunk of application code off the clients and onto distributed servers. Only limited application code and presentation functions would remain on the client.

"It'll allow us to alleviate some of the requirements for lots of computing resources at the client side," DeLima explains. "We'll also be better able to manage applications because they'll be on just a few servers instead of thousands of PCs."

The move to NT, even if it doesn't materialize, is a testament to Ryder's foresight and planning.

Key RyderLINC players gave up the warmth of Miami for a few days last January to make the trek to Redmond, Wash. Their mission: to explain RyderLINC requirements to Microsoft Corp. and get feedback on what hardware they would need for the long haul.

It paid off. The Intel Corp. 486-based PCs the company wound up installing each have 60M bytes of RAM, a half-gigabyte of hard-disk space and at least a 66-MHz processor — ample firepower to handle NT.

Likewise, the Compaq ProLiant 2000 servers have ample hard-drive storage and can support dual processors to take advantage of the multiprocessing capabilities in NT.

"You can add another processor into that machine and then just rip," DeLima says.

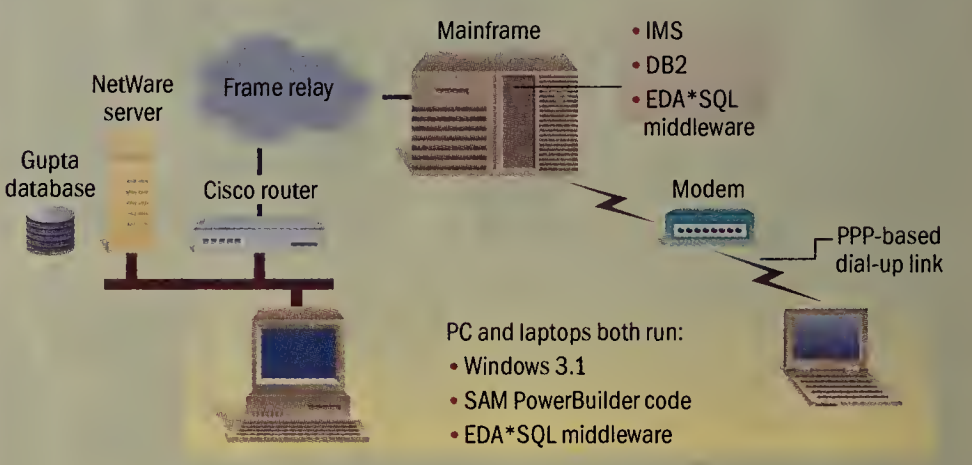
The NT client is attractive because it comes equipped with capabilities Ryder now has to buy separately, including TCP/IP, PPP support and security.

Security is especially important, as it will enable multiple users to share the same PC and help Ryder "lock down" certain portions of a PC so end users can't change the configuration.

What won't be locked down is the look of RyderLINC — that's changing continually as it is put to new uses.

"It's a platform for the next generation of Ryder applications," Hamilton says. "We're just seeing the tip of the iceberg." ■

SAM SHOWS THE WAY



Ryder's Simplified Asset Management (SAM) application helps Ryder personnel make better decisions faster by giving them easy access to data stored anywhere in the enterprise, be it on a local server or remote mainframe.

RYDERLINC at a glance

- 786 clients deployed as of Nov. 1, 1995
- 4,000 clients predicted by end of 1996
- MCI frame relay-based WAN
- Cost: $20.5 million

Key features:

- LANs in all regional and district offices
- Windows interface to mainframe and AS/400
- Location transparency
- Laptop PC dial-in support for the virtual office
- Common application components
- Component change flexibility
- Electronic software distribution
- Common supportable PC configuration
- Data replication for LAN-based DBMS access

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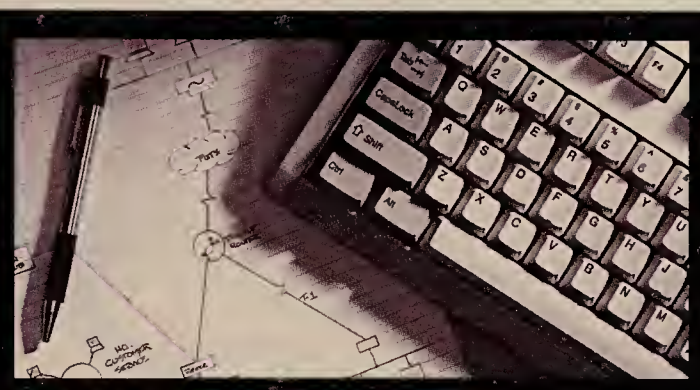

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USER EXCELLENCE ENTRANTS PROVE TO BE TREND-MAKERS

Health care providers keep a finger on the pulse of net technology

By Jodi Cohen

Paul Brown says the productivity gain he's seen since implementing wireless LANs at his hospital is equivalent to getting an administrator to work around-the-clock free for a month.

Entering information right at patients' bedsides via laptops with wireless LAN adapters has trimmed about 3 minutes off the time it takes to admit patients into the hospital's emergency room, says Brown, director of network operations at Helix Health Systems in Baltimore. Given that the facility admits about 15,000 patients a year through its ER, that adds up to a savings of 31 working days.

Helix's *Brown*

While the medical side of the health care industry has long enjoyed cutting-edge technologies, such as CAT scans and magnetic resonance imaging (MRI), the administrative side has traditionally lagged the networking technology curve.

But Brown and others who entered *Network World's* 1995 User Excellence Awards competition are showing the power of networking in health care by implementing technologies such as Asynchronous Transfer Mode backbones, wireless LANs and videoconferencing.

Brown, for example, is spreading the wireless word not only to the ER, but also to the hospital's respiratory therapy unit, where the technology helps expedite treatments and improve patient care.

"Therapists used to have to track down doctors to obtain a patient's instructions," he says. "But now they can respond to new and changed patient orders without having to find a physician." This flexibility allows them to spend more time at the patient's bedside, Brown says, which increases the quality of care.

In St. Louis, Dan Weidman, director of advanced technology at St. John's Mercy Health System, just installed an ATM backbone to support high-bandwidth, multimedia applications such as radiological imaging.

"Health care providers are no longer frustrated by having to wait 5 minutes for a screen to come up; that's been cut down to about 2 seconds," he says.

Another health care power player, the national Center for Disease Control (CDC) in Atlanta, just upgraded its T-1/T-3 metropolitan-area network to a 100M bit/sec FDDI dual-attached ring, creating a 79-mile network of single-mode fiber.

The CDC also is set to upgrade its 16M bit/sec token-ring backbones with 100M bit/sec Copper Distributed Data Interface, and move routing services from Novell, Inc. file servers into high-speed routers and switching hubs. The strategy will put user workstations only one high-speed connection away from any application service.

At Stanford University Medical Center, videoconferencing technology enables primary care physicians to consult with specialty care experts without the physicians having to leave their office, eliminating the need to travel long distances for a consultation and cutting costs in the process.

A powerful combo: frame relay and SNA

By Michael Cooney

United Technologies Corp. (UTC), Sea-Land Service, Inc. and AmSouth Bank N.A. — three companies in different markets — are very much alike in at least one way: Each has come up with an effective strategy for dealing with SNA in a multiprotocol world.

UTC in 1994 decided to migrate its point-to-point SNA net to public frame relay and handed over the entire project to IBM's outsourcing arm — Integrated Systems Solutions Corp.

The strategy paid off, as the project was completed in only 11 months, with the actual cutover to frame relay taking only

See **Frame relay,** *page 70*

Schools draw power from the Internet

By John Robinson

Educational institutions of all sizes entered this year's User Excellence Awards competition in force, often reporting how the Internet is helping to let students and administrators in on the power of networking.

In Utah, the state legislature ponied up $5 million to fund UtahLINK, a data network designed to provide all state public schools with Internet connectivity. "It was an easy sell," says Maggie Hopffgarten of Utah's Instructional and Educational Services department. "Students are using the Internet to answer their own questions, and teachers are using it to better prepare for their lessons."

MATT FOSTER

In Kearney, Neb., where in 1993 students had no Internet access, 100 school districts are now networked through Cisco Systems, Inc. 2500 series routers.

See **Internet,** *page 70*

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Frame relay

Continued from page 68

three months, says Jim Garlans, manager of network services for the Newington, Conn., company. "The network now delivers subsecond response time for SNA data, and LAN access is available across the enterprise," he says.

The key to UTC's success was the way his group became a "manager of managers," Garlans says. "We let the suppliers worry about the problems of running a data network, and we manage their decision makers."

Sea-Land, a division of transportation industry giant CSX Corp., likewise migrated its 9.6K bit/sec leased-line SNA net to a frame relay backbone provided by WorldCom, Inc. Remote SNA and multiprotocol LAN traffic is pumped onto the backbone by Netlink, Inc. OmniLinx frame relay access products. Sea-Land retained its investment in IBM 3745 front-end processors (FEP) by upgrading them to Network Control Program 7.1, which supports native frame relay circuits.

At first, the FEP would lock up if SNA traffic on the frame relay circuit burst above the committed information rate (CIR). Setting the CIR equal to the FEP's maximum transmission rate, which prevents bursting, fixed the problem.

The bottom line: The firm cut its telecommunications costs in half and improved enterprisewide response times by 30%.

Users at AmSouth Bank in Birmingham, Ala., saw response time reduced from 6 seconds to 1 second after their SNA net was moved to a public frame relay backbone.

"One of our biggest challenges was getting the vendors to put away the hype about frame relay and prove to us in a pilot environment that it could do what they were promising," says Rick Nelson, vice president and telecommunications manager at AmSouth Bank. Vendors also had to prove they could handle the company's four primary protocols — SNA, IPX, NETBIOS and bisynchronous communications.

"We needed a network infrastructure that was easy to make changes to quickly," Nelson says, noting that AmSouth Bank has merged with or acquired 18 other financial institutions in the past two years. "Frame relay makes that easier than a pure SNA network."

But that's not all.

"I couldn't afford to set up the disaster recovery links the fully meshed public frame relay net has inherently," he says. "We now have hot backup capabilities all the time." ■

Internet

Continued from page 68

"Now, here in rural America, our students have access to the same resources that everyone else has," says Alan Wibbles, media technology director.

Students used the Internet to have school supplies shipped to students in Kobe, Japan, after the 1995 earthquake there.

"They were excited to be able to help out," Wibbles says.

And it doesn't take a huge budget to get connected.

The Kendall Campus of Miami-Dade Community College provides its students with Internet services including Simple Mail Transfer Protocol, File Transfer Protocol, telnet and World-Wide Web access at a total software cost of $500. Traci Henderson, campus network services director, credits a "talented and innovative staff" for keeping costs down.

Looking down the road, Wheeling Jesuit College in Wheeling, W.Va., serves as the National Aeronautics and Space Administration's principal national research and development center for educational technologies.

C. Daniel Miller, executive director of the program, says the idea is to research how teaching and learning can be enhanced for students across the country.

More power to you, Mr. Miller. ■

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PLANNING SURVEY

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We quizzed them on the most pressing issues of the day, including bringing the force of the Internet to bear on fledgling electronic commerce efforts and dealing with net application concerns such as pushing groupware across the enterprise. We also found out how your colleagues are dealing with the migration to Asynchronous Transfer Mode switching and newer versions of NetWare and Windows, not to mention the integration of network, systems and desktop management.

GET THE SCOOP ON:

- Web mastering, page 72.
- Applications, page 73.
- ATM switching, page 74.
- Server strategies, page 75.
- Net management, page 76.

On the next few pages, you'll see what managers said about their plans in five areas: electronic commerce, network applications, internetworking, network and desktop operating systems, and network and systems management. San Francisco-based freelance writer Paulina Borsook peppered the survey results with advice from various network managers on how to develop implementation strategies for projects in each of those areas.

Together, the numbers and advice should give you some solid ideas for how to tackle the projects that lie ahead.

Good luck.

—Jim Brown

TERRY COLON

Web mastering lies ahead

If you're like many of the managers interviewed for *Network World's* Technology Planning Survey, tapping the Internet — the World-Wide Web, in particular — to do business is uppermost in your plans this year. In fact, 90% of survey respondents consider the Web important or critical to their 1996 plans.

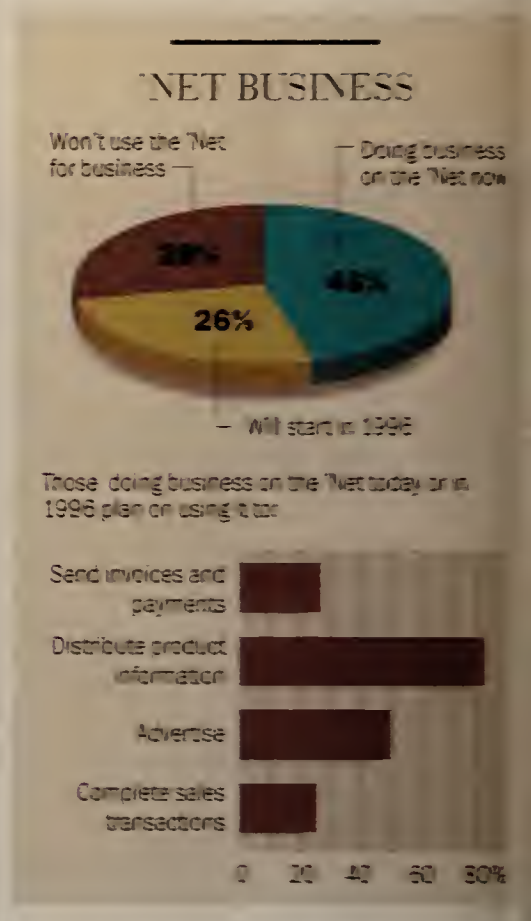
Excited as they may be about using the 'Net to streamline operations or get their message out to a wider audience, managers also are anxious about its lack of security.

"The lure of the 'Net is so powerful," says Ellen Ullman, lead consultant for a network being built by the San Francisco Department of Health's AIDS Office. Workers at different AIDS service agencies throughout the city will use the 'Net to exchange electronic mail and browse for information. Sensitive information, such as data about patients, will remain securely off the 'Net due to security concerns.

Ullman advises organizations with limited funds, particularly those that draw money from the public well, to keep their 'Net plans within reason.

For example, Ullman's agency doesn't have the personnel or expertise to be a Web wonderkind, or to pay attention to the security, privacy and electronic publishing considerations of maintaining a complete 'Net presence.

Young Etheridge, technical director for the computer research division of



computer security device manufacture ManTech Strategic Associates in Oa ridge, Tenn., and manager of a 5,00 node network, is worried abou cryptographic standards.

However, Etheridge is in the cryptogr phy vanguard by endorsing privac enhanced messaging (PEM), a secu messaging standard being developed l the Internet Engineering Task Force.

PEM, which the U.S. governme would prefer to block for export, e plows Pretty Good Privacy public-k encryption.

The trade-off between security a access is also on the mind of Tom Higgo Unix administrator for Xircom, Inc. Thousand Oaks, Calif., a maker of n work adapter cards for laptop compute Higgott manages eight offices around t world connecting approximately 7 nodes, and recently installed a $2 mill network.

Higgott uses the 'Net to provide us with access to list and news servers, as w as the ability to browse the Web from th desktops.

He also uses the 'Net for electron commerce, such as spreading sales information.

Classic security measures — such packet-filtering and running firewall s ware on routers — are installed to con 'Net access. "But it's cumbersome and he says.

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Apps weigh heavy on users' minds

In 1996, workers at 65 San Francisco AIDS service agencies will be able to pump data into a centralized database server donated by Sybase, Inc. The distributed database processing project will streamline operations to the point where 200 geographically dispersed clients each will use identical database applications.

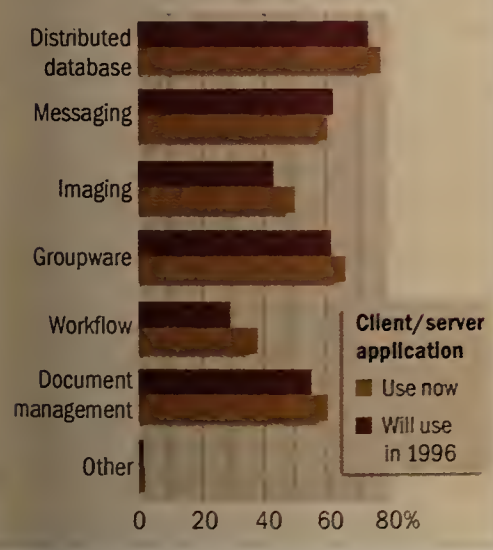
The AIDS organization is far from alone in such an undertaking. Of the respondents to *Network World's* Technology Planning Survey, 74% named distributed database processing their No. 1 network application in 1995. That number will grow to 78% in 1996.

Not everyone is ready to go full bore with the technology, however. Young Etheridge, manager of a 3,000-node network at computer security device maker ManTech Strategic Associates in Oakridge, Tenn., has seen little call for distributed databases in his shop, except for some small-scale work for clients.

Groupware is another popular application, although it is being deployed more at the workgroup level than companywide.

TOP APPLICATIONS

Forget all those sexy client/server-based collaboration tools and smart agents. Implementation of distributed databases has been a top concern in the client/server world and will continue to be so.



While groupware usage overall goes from 62% in 1995 to 67% in 1996, only 31% of the respondents use it companywide now, with 21% planning to roll it out across the company in 1996.

Some net managers, such as Etheridge, won't use it all because they are not yet convinced it will increase productivity.

Other users have more pressing application issues such as dealing with the proliferation of World-Wide Web browsers and perhaps learning more about using Sun Microsystems, Inc.'s Java tool for developing Web applications.

Larry Shelton, associate director for technology services and communications at Creighton University in Omaha, Neb., will be among those happy to see Java make it possible to split some Web application processing chores across both the Web server and browser.

Etheridge likes Java for a different reason. "Java is so simple, and the connectivity's so nice, regardless of the desktop platform used," he says.

On another front, Etheridge sees TCP/IP providing the backbone for many networked applications.

But Etheridge realizes that he will have to use Microsoft Corp.'s OLE when building distributed applications because of his company's heavy reliance on other Microsoft products.

The market position of Microsoft may explain why 55% of respondents will use OLE companywide or in workgroups during 1996. Contrast that with the 57% of respondents who say they won't bother with the Object Management Group's Common Object Request Broker Architecture in 1996.

Implementations of the Open Software Foundation, Inc.'s Distributed Computing Environment will fare well in 1996, too, with 61% of respondents opting to use it companywide or in workgroups, up from 56% in 1995.

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Circle Reader Service #50

The ATM switch is on

It's a common complaint among network managers: There's never enough bandwidth to support traffic growth. To remedy that, *Network World* Technology Planning Survey respondents are gravitating to switching technologies, particularly Asynchronous Transfer Mode.

But the incorporation of switching technology does not seem to be coming at the expense of tried-and-true technologies such as routing. In fact, a whopping 72% of respondents plan to up their use of routers by an average of 44% in 1996.

Whether this trend continues remains to be seen. Tom Higgott, a Unix administrator responsible for interconnecting eight offices of Xircom, Inc., a network adapter card maker headquartered in Thousand Oaks, Calif., says adoption of switching technology will lessen the role of routers.

Switches can act as intelligent bridges or low-end routers, he adds, which means they could eventually displace all but the very application-specific routers in the enterprise.

Higgott — like many other survey respondents — plans to swap out FDDI hubs for ATM switches to provide high throughput rates as the number of users increases. Throughput on an FDDI net, he says, can drop as more users send data.

"FDDI can't transmit contiguous packets, but ATM [can]," Higgott says. He also plans to be among the 34% of survey respondents who will install 100M bit/sec Ethernet in 1996 simply to increase bandwidth.

Higgott likewise counts himself among the users willing to ship voice over wide-area ATM services. Thirty percent of respondents are already using ATM services to support an average of 19.5% of their total traffic. The number of ATM service users will jump to 53% in 1996, for an average of 33.39% of overall traffic.

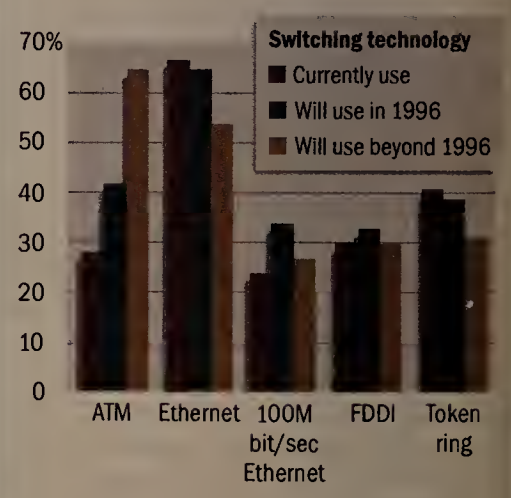
Of those using ATM in 1995, 47.7% tapped it to support voice. That number will dip slightly in 1996 to 41.5%.

Higgott says if you're confident enough to use ATM in the first place, it's really a no-brainer to use it for voice, even though to date ATM has been considered primarily data-oriented.

Just the same, a lot of those surveyed will stick with frame relay, including Stephanie Beer, an account manager who tends to a 50-node network at CPU Distributing, a computer, software and network equipment distributor in Houston. Beer believes ATM is still not quite there yet and that the more mature frame relay is the most cost-effective way to go.

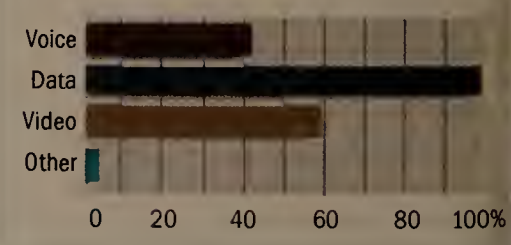
SWITCHING PLANS

ATM switching will balloon over the next few years, while the use of other switching technologies steadily drops off, or peaks in 1996 and then drops off.



ATM AT YOUR SERVICE

ATM services will be used by 53% of respondents in 1996 for 33.9% of overall traffic. Here's how the traffic will be split:



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Hannover 14.-20.3.1996

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Spotting trends in server strategies

The idea of standardizing on a common application server platform is catching on.

More than half the respondents to *Network World's* Technology Planning Survey will have a standard application server platform in place by the end of 1996, with Microsoft Corp.'s Windows NT Server nudging out Novell, Inc.'s NetWare 3.X and 4.X as the most popular NOS.

The San Francisco Department of Health's AIDS Office and Xircom, Inc. both adopted Windows NT Server to support their applications, albeit for very different reasons.

"We didn't have the budget for expensive Unix personnel," says Ellen Ullman, lead network consultant for the San Francisco AIDS office. "We also wanted an application server, not a file server like NetWare. Creating NetWare applications is a black art, while Windows NT Server is easy to administer."

Over at Xircom, which makes network interface cards for laptops, the issue had more to do with finding a network operating system that ran on inexpensive server hardware, says Tom Higgott, the firm's Unix administrator.

After experiencing its first loss after 15 consecutive quarters of profit, Higgott couldn't spend money in the way he was accustomed to. "I wanted to avoid another $20,000 [Sun Microsystems, Inc.] SPARC server, so we ended up with Windows NT." He brought an older Compaq Computer, Inc. PC out of storage to run Windows NT Server.

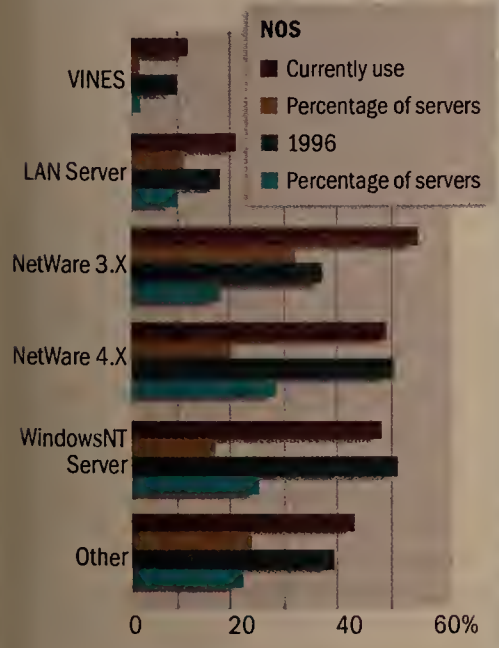
Despite NT Server's edge as an application server, NetWare will continue to be used on a greater percentage of servers overall in 1996, even as reliance on NetWare 3.X takes a nosedive.

NetWare 3.X, now being run by 54% of respondents on an average of 31% of their servers, will be used by only 36% of respondents on a scant 17% of their servers in 1996.

What are these folks using instead? Well, in 1996, NetWare 4.X and Windows NT Server will be used by only 1% and 3% more users, respectively, compared to those in 1995. But overall usage at those shops will increase more dramatically, as each NOS will run on an average of 8% more servers in 1996. Given that NetWare 3.X is showing a 14% drop in the average number of servers, it seems some of those users are increasing their use of NT Server at the expense of NetWare.

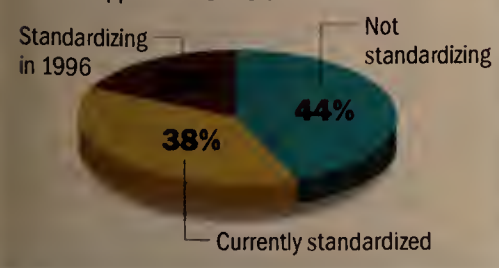
NOS PLANS

The major shift in 1996 NOS usage is a jump in the percentage of servers running NetWare 4.X.



STANDARD RESPONSE

A handful of respondents will adopt a standard NOS for application servers in 1996.



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Simple network management plans

Respondents to *Network World's* Technology Planning Survey have dramatically different views on the state of integrated network and systems management platforms.

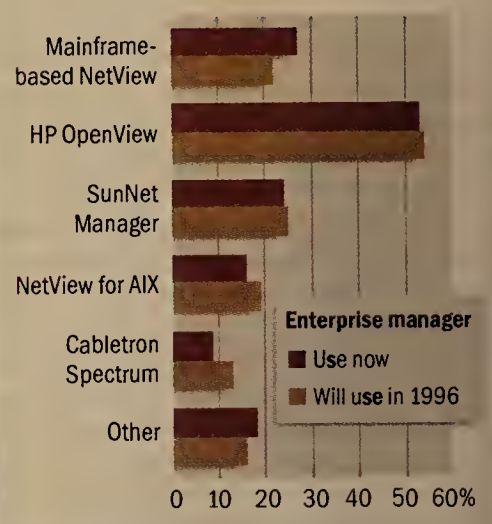
Half claim to either already be performing network, systems and desktop management from a single platform or say they will be within the next two years. But of the remaining users, 30% feel it's an impossible task and 19% expect it will take more than three years.

And survey respondents are in no rush to swap out their strategic management platforms. Nor do they want to invest in every newfangled technology.

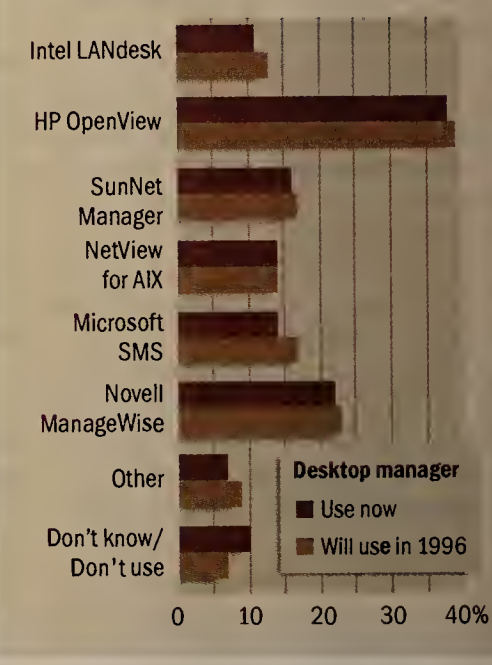
"It's a hit-or-miss affair and it's not worth the cost of going through a trial-and-error exercise of buying one product after another to see which one will work," says Young Etheridge, manager of a 3,000-node network for computer security device maker ManTech Strategic Associates in Oakridge, Tenn.

PLATFORMS OF CHOICE

Respondents seem happy with the enterprise management platforms they've picked.



Likewise with their desktop managers.



Perhaps that is why the survey shows little planned fluctuation in strategic management platform deployment. In fact, the percentage of respondents moving from one existing enterprise platform, such as Hewlett-Packard Co.'s OpenView, IBM's NetView for AIX and SunSoft, Inc.'s SunNet Manager to another is slight — 4% at most. Likewise, movement from one desktop management platform — such as HP's OpenView and Novell, Inc.'s ManageWise — to another is small.

Maybe that's because users are busy trying to complete much simpler net management chores. "We're spending a lot of time trying to figure out the best ways to get requests for management info back from polled equipment," says Larry Shelton, associate director for technology services and communications at Creighton University in Omaha, Neb. To that end, he's looking at a Simple Network Management Protocol agent from Unisys Corp. to check data received from devices.■

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Public Relations Manager
Will work closely with corporate and marketing management to accelerate public awareness of Xylan's products, technologies, and market position. Public relations experience in the networking industry is required; router, LAN switch, and/or ATM switch experience is an advantage.

Senior Product Evangelist
Will help to develop and communicate Xylan's message in a variety of ways, including specific account activity, seminars, presentations at public forums, and others. Will be responsible for the Western US. Experience in the networking industry as a product evangelist, director of marketing, or senior product manager is required.

WebMaster
Will take full charge of all phases of Xylan's Web site design and implementation. Should understand both marketing and technical aspects of Web site implementations. Will design and implement updates to the site and will supervise internal and contract resources as appropriate. Requires experience in the design and implementation of Web sites and a thorough knowledge of Web servers, Web browsers, http, html, and associated development tools. Experience with vrml, Java, or similar complex languages is desired.

Writer
Will write and edit data sheets, brochures, white papers and other marketing materials for Xylan's literature program. Five years marketing writing experience in the networking industry is required and experience with LANs, routing, and/or LAN switching is preferred.

SERVICE & SUPPORT:

Sr. Product Support Engineer - Internetworking
Will have a minimum of 3 years of LAN/WAN product support or similar experience (end user experience is a plus). Good writing skills are a must. This person must have the ability to work well in a team environment. Good technical knowledge of routing/bridging/switching and at least two of the following technologies - Ethernet, token ring, FDDI or ATM - are required.

Sr. Product Support Engineer - Network Management
Will have a minimum of 3 years network management product support or similar experience (UNIX administration experience is a plus). Good writing skills are a must. This person must have the ability to work well in a team environment. Good technical knowledge of UNIX, SNMP, HPOV, SunNet Manager, NetView AIX and general networking are required.

Sr. Customer Support Engineers
Will have a minimum of 3 years of LAN/WAN customer support (telephone) or similar experience. Good customer relations capabilities are a must. This person must have the ability to work well in a team environment. Good overall network knowledge (NOSes, routers, bridges, switches, etc.) and excellent trouble-shooting skills are required.

System Certification Engineer
Will have a minimum of 2 years of experience in the development, management and testing of networking systems. This person must have the ability to work well in a team environment. Knowledge of network equipment, NOSes, test equipment and network applications are a must. Third party test management experience (e.g., UNH, ENL, etc.) is preferred.

Technical Trainer
Will have a minimum of 2 years experience in the development and delivery of technical training material to end users and/or resellers. Excellent presentation skills are required. Good overall networking knowledge is required and router/ATM/switch course development is preferred.

DEVELOPMENT:

Senior Software Engineer
Will have a minimum of 8 years of programming data communication systems with hands-on experience in at least 3 of the following technologies: frame relay, LAN/WAN internetworking, ISDN, Ethernet, token ring. This person must have a high proficiency in C language, and the ability to design, write specifications, program, and debug in an embedded system environment. 68000 assembly language and 68360 programming experience are preferred.

Senior Test Engineer
Will have a minimum of 8 years of programming data communication systems with hands-on experience in at least 3 of the following technologies: frame relay, LAN/WAN internetworking, ISDN, Ethernet, token ring. This person must have the ability to take full responsibility for testing embedded communications systems: writing test plans, working with software and hardware engineers, debugging, testing and verifying features, problem tracking. Must be able to travel to customer sites during rollout and early release phases.

SALES:

Territory Sales Managers
Responsible for development of various territories, provide complete market coverage, as well as targeting major accounts. Minimum of 3 - 5 years of successful selling in the LAN/WAN market. Excellent selling and technical skills are required in the routing/bridging and switching arena, with emphasis on Ethernet, token ring, FDDI and ATM. Excellent communication skills are required.

Systems Engineer
Provide pre-sales support to sales reps, customers, VARs, and OEMs. Assist in technical training, seminars, writing and preparation of RFP's. Will have a minimum of 3 - 5 years of LAN/WAN technical experience (directly with end users a plus). Excellent communication and technical skills are required. Must be familiar with routing/bridging and switching markets. Familiarity with Ethernet, token ring, FDDI, ATM and network management are highly desirable.

Regional Manager - Commercial Sales (West)
Will drive revenues within the Western US from the Rockies to the Pacific Coast. Will identify and develop each market in the territory to improve coverage and market share each year. Will oversee the development of channels within the territory to improve their ability to sell and support Xylan products. Will manage all territory managers and system engineers in the West, and will be responsible for the management and accuracy of forecasts within the region.

Canadian Country Manager
Will be responsible for driving revenues and market development throughout Canada. Will identify and develop each market in Canada to improve coverage and market share each year. Will oversee the development of channels within Canada to improve their ability to sell and support Xylan products. Will manage all territory managers and systems engineers in Canada, and will be responsible for the management and accuracy of forecasts within Canada.

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National Telco Sales Manager
Will be responsible for establishing Xylan solidly in the telco industry throughout the United States. This is a senior sales/marketing position, which we prefer but do not require to be based in the East. Will work with regional managers, territory managers, systems engineers, and Xylan's established channels. Will also be establishing new sales and marketing channels. Excellent selling and technical skills are required in the routing/bridging and switching arena, with emphasis on Ethernet, token ring, FDDI and ATM. Excellent communication skills are required

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- **Systems Engineers** - To provide pre-sales configuration assistance to Sales, Support and customers to include solution configurations, system diagrams, and proposals in LAN environments. These positions require 5 years of in-depth technical experience with PCs, high-end servers, LAN/WAN, and associated components and strong communication/presentation skills. CNE or equivalent certification is desirable. An Engineering Bachelor's degree or equivalent work experience in Sales/System Engineering and/or marketing experience a plus. Travel is required (15-20%). **Code SE-JC.**

  Positions are currently available in support of the following manufacturers/ technologies:
  - LAN/WAN: 3COM, Cisco, Proteon
  - SYSTEMS/PERIPHERALS: Conner RAID Subsystems, Plextor CD/Optical and Zenith Z-Power Servers
  - CLIENT/SERVER: Multiple manufacturers
- **(Senior) Support Technicians** - To provide pre and post-sales technical support in a call center environment. Requires 2-5 years experience selling/supporting PCs and associated components including LAN configurations, 2 years computer service experience, and a knowledge of Windows-based applications. **Code SST-JC.**
- **Network Support Engineers** - To provide technical phone support to Tech Data customers. Requires 3-5 years experience in hardware support and strong customer service, networking support and troubleshooting skills. These opportunities also require advanced professional certification including Novell, SCO, ACE, Microsoft MCSE or IBM Certified LAN Server Engineer. **Code NSE-JC.**
- **Lead Network Support Engineer** - To serve as an escalation point for technicians in software support. Requires strong troubleshooting skills, the ability to provide solutions, and experience with a wide variety of software products and operating systems. **Code LNSE-JC.**
- **Technical Support Manager** - Reporting to the Manager of Technical Services, this position will provide leadership and direction in a technical phone support environment to a staff of 2-3 supervisors with 20-30 technical support engineers. Responsible for overall operational performance and a superior level of customer satisfaction. Requires 3-5 yeors leadership experience in a high volume technical phone support environment. **Code SSM-JC.**
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NETWORK PRODUCTS BUSINESS

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Principal Software Engineer – Network Management

You will design and develop network management application software for Digital's enVISN architecture. This includes working in such development areas as router management, ATM management, network topology maps, virtual LAN configuration services, and network configuration modeling. Development will be done primarily dealing with Windows and Windows NT. To qualify, you must have 3+ years' software development experience in C and C++ and a solid background in networking, SNMP and network management.

Principal Software Engineer – Remote Access/Wireless LAN

As part of a very creative and successful team, you will develop software for Remote Access/Wireless LAN products which are part of the Internetworking product family. This includes high-quality designing, implementing and testing of Remote Access Network products. To qualify, you must have a BSCS or equivalent, 6+ years' experience, an understanding of embedded systems and extensive experience in C programming. Knowledge of 68000 programming, network products, PCMCIA, driver development, wireless communication, modems, MIBs and security a plus.

Principal Software Engineer – Technical Support

Working in a dynamic and fast-paced environment, you will provide pre- and post-sales support on Digital's HUB and LAN products to distributors and resellers. Acting as part of a team of networking experts, you will also provide detailed in-depth engineering product knowledge to the resellers to facilitate their ability to bid and sell HUB and LAN products. To qualify, you must have a BSEE/CS or equivalent and 5+ years' LAN experience. Direct customer experience a plus.

Principal Software Engineer – ATM

Using your strong understanding of data structure and cache organizations, you will develop ATM LAN emulation and signal codes on a high-performance switching platform that interfaces to Ethernet, Fast Ethernet and FDDI. You will also be responsible for future protocol work for routing over ATM. Working with a common switching and routing code on a team-based project that includes follow-ons is essential. Project also includes leading edge ASIC components and technology as well as clearcase-based development tools in a distributed UNIX® environment. To qualify, you must have a BSCS, 5 years' experience in bridging and routing protocols and assembler coding experience.

Manager – ASIC Design

As the technical and management leader of a group of talented network ASIC designers for the HUB group, you will allocate engineering resources to produce both repeater and switch products. Influencing decisions as to which products to build and developing new repeater and switch designs is essential. The ability to design chips (CMOS ASICs) and negotiate with external vendors is also required. To qualify, you must have a BS/MS in EE, experience with logic/chip design, and a thorough understanding of Ethernet network repeaters, switches and systems.

Principal Engineer – ASIC Design

You will design and test new network repeater and switch chips (usually CMOS ASICs) for the DEChub 900 organization. This includes gate-level design or synthesis, simulation, timing verification and test vector generation. Lab debug assistance of prototype devices may also be required. To qualify, you must have a BS/MS in EE, logic/chip design experience, and the ability to work independently and provide leadership for small groups. Familiarity with CADANCE designs and an understanding of Ethernet networks and switches highly desirable.

Software Manager – Remote Access

Acting in both a technical and managerial role, you will manage a highly motivated software team in the development of ISDN-based remote access products. To qualify, you must have a BSCS/EE or equivalent, 10+ years' software development experience (with at least 3 years in management), and direct experience in developing ISDN products. Knowledge of routing/ WAN protocols and security a plus.

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VOICE SPECIALIST - The ideal candidate will have 3-7 years of telecommunications industry experience including strong expertise in voice network design, and PBX, Voice Messaging and VPN technologies.

LAN/WAN SPECIALIST - The ideal candidate will have 3-7 years of telecommunications industry experience including strong expertise in circuit-switched, packet-switched, and Frame Relay network design.

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Applicant must have 7 to 10 years experience in developing highly complex and distributed systems. In-depth knowledge of computing platform, data communication, distributed technologies, OO methodologies, advanced transport network technology (i.e. SONET, ATM) and industry standards is required. Knowledge of C++ development is a plus. Response Code: MGMT/NW

S/W Technical Development Managers (Software Engineering Organization)

Applicant must have 4 years of work experience in Object Oriented technology, telecommunication business, 7 to 8 years experience in managing a large software development team. Knowledge of TMN and standards is a plus. Responsibilities include providing technical direction to the team in delivering an enterprise wide Network Management software solution, planning, budget management and personnel management. Response Code: S/W/NW

Quality Assurance Manager

Candidate must have 7 to 8 years experience in managing all aspects of software testing, quality assurance software change management, knowledge of software development, implementation, ISO 9000 certification, SEI capability maturity model. Responsibilities include managing and providing technical direction to the software test and quality engineers, planning, budget management and personnel management. Response Code: Q/NW

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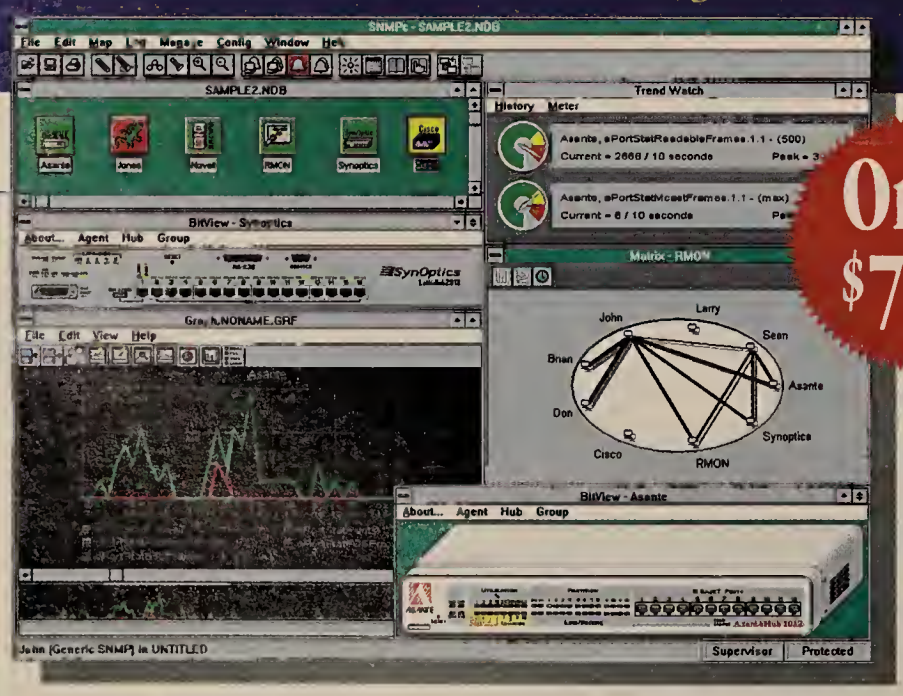

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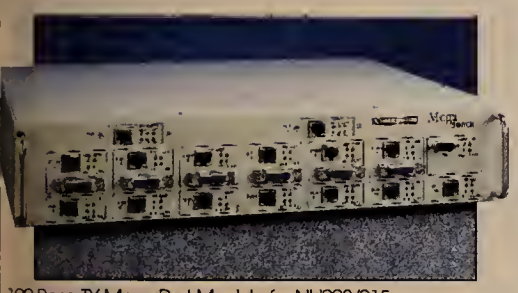

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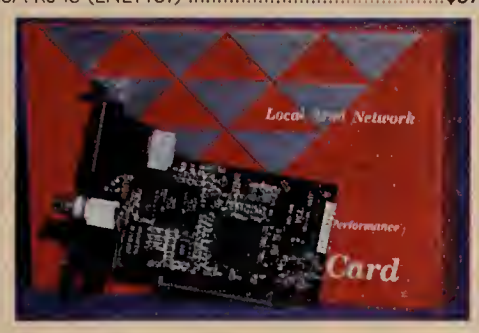

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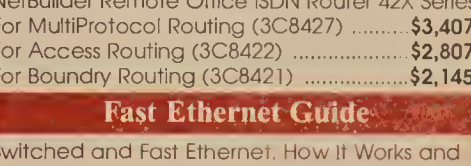

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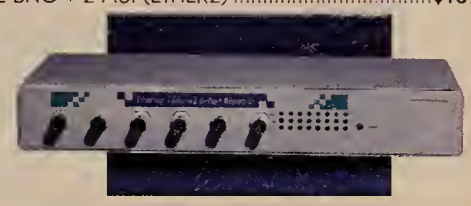

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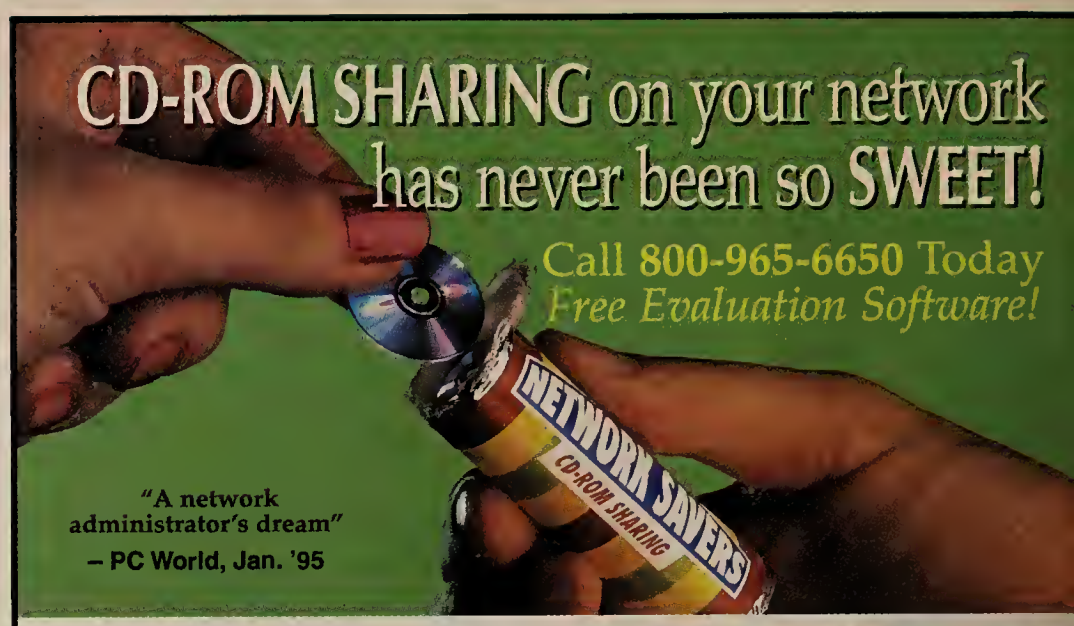

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8mm QG-112MA		8.92	8.34	8.07
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SONY				
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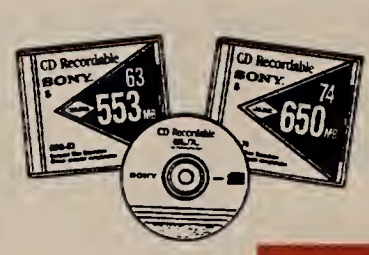

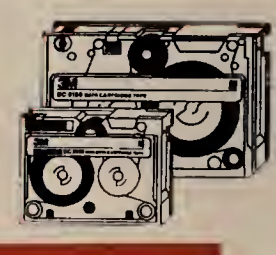

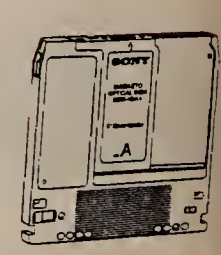

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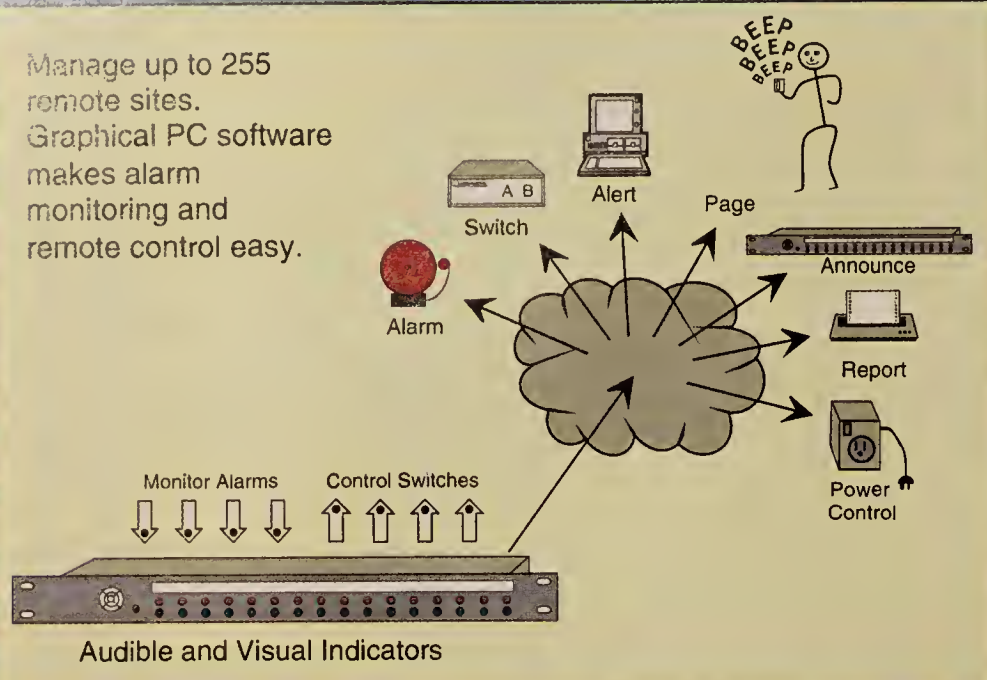

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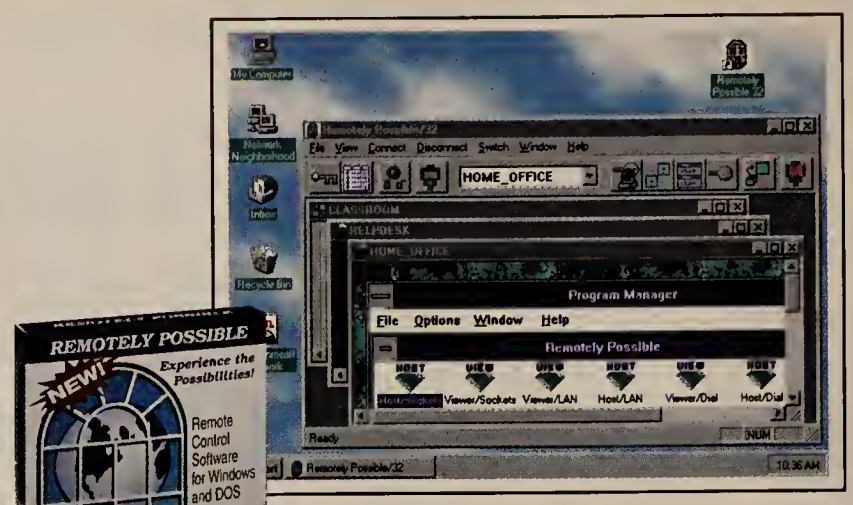

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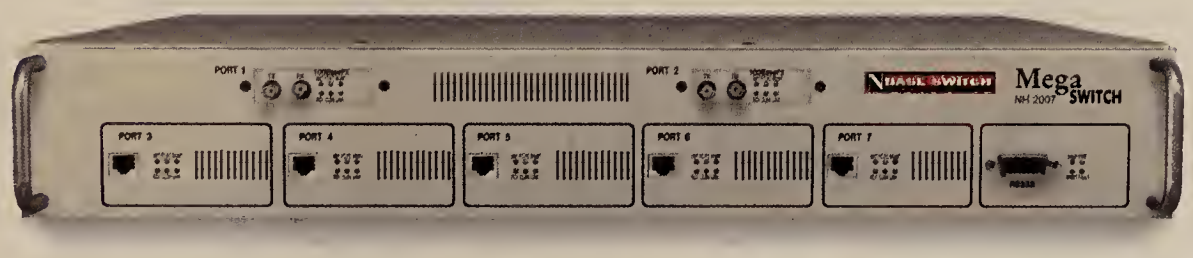

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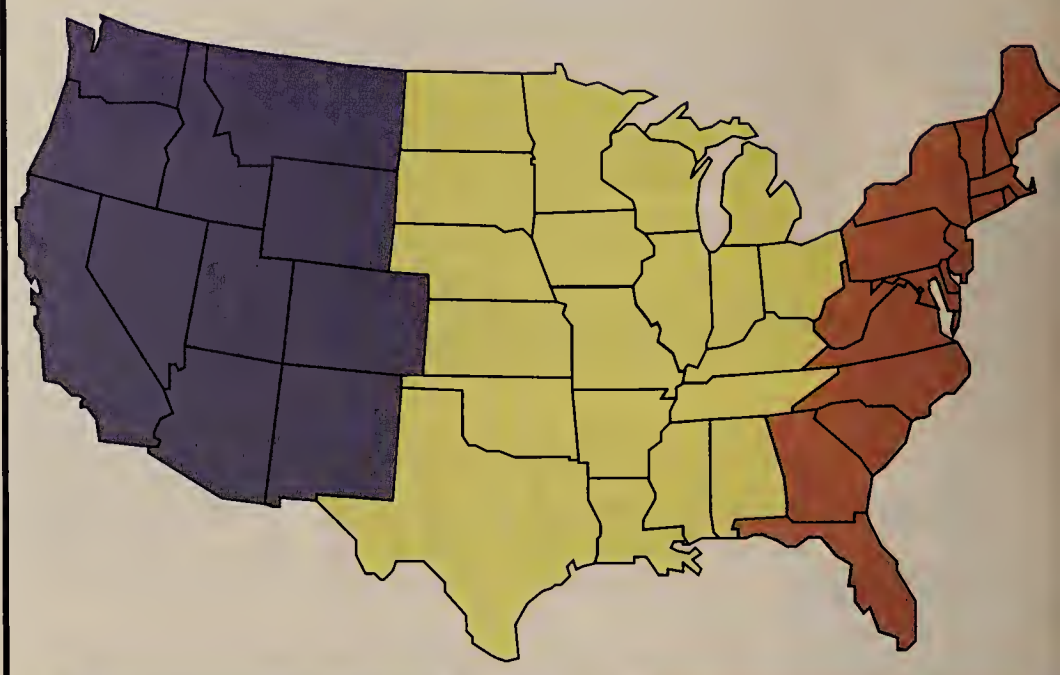

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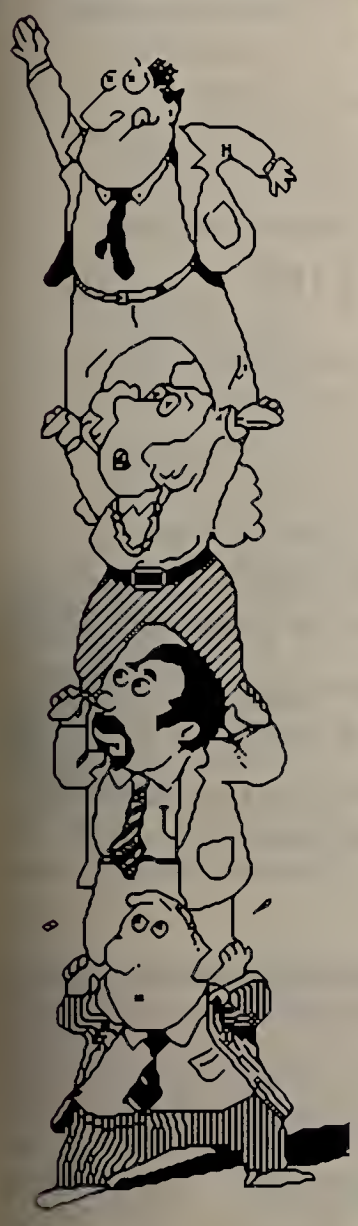

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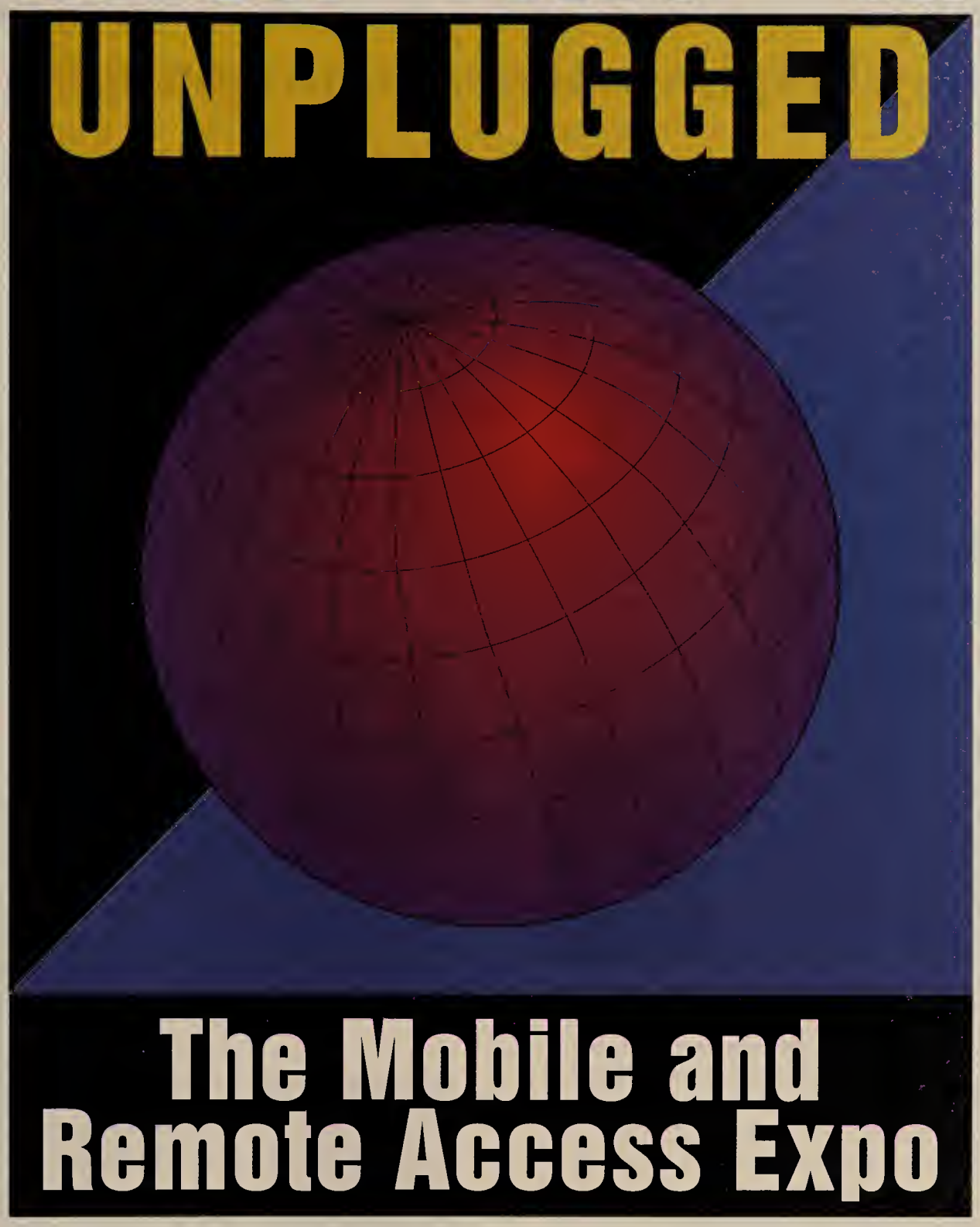

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Cubix is dedicated to making remote access as easy as "login", as secure as "enter password, enter PIN number", as comfortable as your own "setup screens", as fast or faster than your desktop system at work, and as fault tolerant as a "superserver". Cubix's remote access family includes internet servers, application servers, file servers and other managed PC platforms for network specialty services. In 1996, Cubix plans to further capitalize on its market-leading PC product strengths — fault-tolerance, consolidation and remote manageability.

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ED KENNEDY

Vice President Worldwide Marketing
Dynatech Communications

There will be several changes that will affect us in 1996. First, remote computing will gain wider acceptance in the business community since ISDN will allow workers to have "office networking" capabilities in their homes. The demand for motion on the WWW will drive increased demand for higher bandwidth forcing more rapid deployment of ATM in the LAN. Customer service organizations will need to redefine their boundaries as the networks they support extend past the corporate offices to the home. Carriers will truly become the mainstream of data providers. With growing expertise and infrastructure they will once again expand their services to capture the exploding data transport requirements.

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FRED SORKIN

President, Chairman and CEO
Hummingbird Communications Ltd.

Hummingbird has enjoyed tremendous success in the PC Internetworking software market, and is recognized as the worldwide leader in PC to UNIX integration software. As a customer driven company, we keep a close ear to our customer base, which provides us with strategic information on market trends and technological advances. Addressing customer needs, and understanding their business enables Hummingbird to compete in, and dominate some segments of the rapidly changing landscape called the PC-Internetworking market.

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DR. GEORGE L. LAZIK

President, J&L Division
J&L Information Systems

J&L Information Systems continues to maintain its leadership role in remote access solutions for LANs, a technology it pioneered over ten years ago. At the same time, the company is now applying the vast expertise it gained over these years with clustered computing towards providing powerful, preconfigured Internet Access Servers to this rapidly emerging market. J&L's ChatterBox™ family of hardware and ChatView™ SNMP resource management software is known and used worldwide where truly fault tolerant and highly manageable solutions are needed for mission critical applications. Chatterbox™ systems containing up to twenty-eight Pentium processors in one enclosure, each supporting an independent application, are not uncommon.

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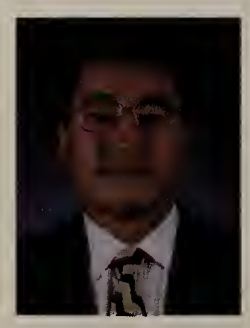

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EDITORIAL INDEX

3Com....34

A

America Online....6
Ameritech....19
AT&T....52

B

Banyan....56
Bay Networks....52
Bloomberg Financial Markets....38

C

Cabletron....34
Cisco....22,38
Collabra....24
Compaq....53

D

Digital....56

F

Fore....43

I

IBM....22,53,56
Intel....46
Intuit....38

L

Lotus....22

M

MCI....52
Microsoft....34,46

N

Netscape....24,38
Novell....46

O

Oracle....44

P

Platinum....24

S

Sahara....24
Spider....26
Sun....26
SunSoft....26
Sybase....56

T

TCI....43
Tivoli....26

U

Unisys....56

X

Xylan....27

Top 200 Companies list begins on page 12.

ADVERTISER INDEX

Advertiser	Reader Service#	Page#
3Com Corp	26, 27...	28-29,40-41
ACC	28	55
Anixter Inc	39	23
Bay Networks		19
Belden Wire & Cable	45	75
Bellcore	29	48-49
Cabletron Systems Inc	43,44	2-3,59
Cisco Systems		36-37
COMNET		35,54
Compaq Computer Corp		20-21
Cray Communications	38	45
Cubix Corp	30	4
D.C.I./M.E.N.		69
D.C.I./Unplugged		89
Deutshe Messe		74
Digi International		32-33
Digital Equipment Corp	51	39
D-Link	31	95
Hummingbird Communications	41	76
IBM		25
ISOCOR	32	53
J&L Information Systems	50	73
Micom Communications	34	65
Multitech	46	72
NEC Technologies	40	96
NetManage Inc	33	30
NORTEL	47	42
PairGain Technologies	35	27
Proteon	49	60
Racal Datacom	48	11
Sprint		61
StrataCom	36	9
UUNET	42	51
Unisys Corp		47
Xylan Corp	37	70

Marketplace Advertiser Index	Reader Service#	Page#
Avalan Technology	276	84
Azure Technologies	224	83
Capella Worldwide Network	268	82
Castle Rock Computing	252	80
Compact Devices	265	84
Dataprobe Inc	285	84
General Technology Inc	260	80
Isolation Systems Limited	281	86
MaxNET	267	86
N8ase Communications Corp	242	85
Ornetix Network Products	257	82
Tac Systems Inc	239	84
Tec Bridge Data Products	286	82
West Hills LAN Systems	253	81
Wright Line	279	80

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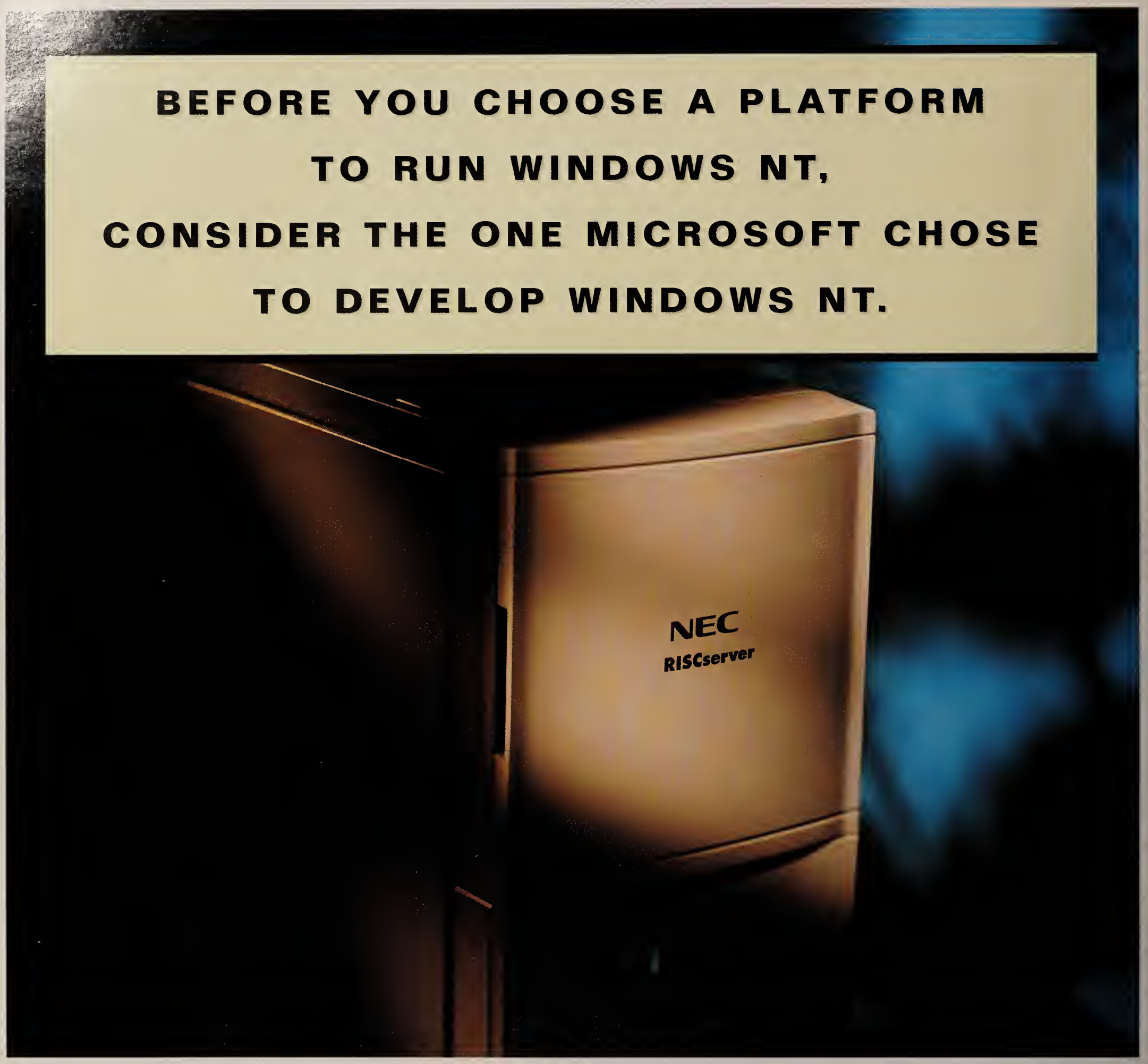

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